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Measuring the Hedge Ratio: A GCC Perspective

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Abstract

In this paper, we examine the effectiveness of minimising the variance of the hedge ratio using different econometric models for the GCC currencies under money-market hedging and cross-currency hedging. Specifically, we determine whether different model specifications and estimation methods yield different hedge-effectiveness results. In other words, does the sophistication of the model improve the effectiveness of the hedge? Our results show that these econometric models fail either to add value or to improve the effectiveness of the hedge.

Keywords: Gulf Co-operation Council (GCC), risk-minimizing hedge ratio, money-market hedging, cross-currency hedging

1. Introduction

After the collapse of the Bretton Woods system and the introduction of flexible exchange rates in the early 1970s—coupled with the tendency of firms to engage in international business—the need has arisen to pay attention to fluctuations in exchange rates. Exchange-rate volatility affects not only firms that operate in international markets, but also domestic firms that compete with other firms that import goods from abroad, as well as purely domestic firms such as utility providers. In other words, even domestic firms that operate in the local market are affected by currency fluctuations (Adler & Dumas, 1984; Aggarwal & Harper, 2010).

This paper is concerned with the management of foreign-exchange risk from the perspective of a domestic firm operating in a member country of the Gulf Co-operation Council (GCC). This is a bloc of countries in the Middle East that includes Kuwait, Kingdom of Saudi Arabia (KSA), United Arab Emirates (UAE), Bahrain, Qatar, and The Sultanate of Oman. Apart from Kuwait, which pegs its currency to a basket of currencies, all of these countries adopt a fixed exchange-rate regime in which they peg their currencies to the US dollar. While a policy of pegging to the dollar keeps the exchange rate against the dollar stable, the exchange rates against other currencies remain volatile. Since these countries trade more with the European Union, Japan, and China than with the United States, exposure to foreign-exchange risk is a major issue of concern for businesses using one of the GCC currencies as a base currency. Given that these countries also lack sophisticated financial markets, hedging exposure to foreign-exchange risk becomes a rather challenging task.

Researchers have been widely estimating the hedge ratio using the ordinary least squares (OLS) estimation method. However, in the financial-econometrics literature, there are many other estimation methods that can be used to estimate the hedge ratio empirically apart from OLS. In this paper, we examine the effectiveness of minimising the variance of the hedge ratio using different econometric models for the GCC currencies under money-market hedging and cross-currency hedging. The purpose of this paper is to determine whether different model specifications and estimation methods yield different hedge-effectiveness results. In other words, does the sophistication of the model improve the effectiveness of the hedge? Our results show that these econometric models fail either to add value or to improve the effectiveness of the hedge. The results from this paper may be beneficial for the managers of firms engaged in international trade, as well as researchers interested in foreign-exchange risk management. In addition, the results will add value to those agents who employ hedging techniques using the currencies of developing countries that lack sophisticated financial markets. This paper starts with a literature review in Section 2, followed by discussion of the methodology in Section 3, data and empirical results are in Section 4 and the conclusion is in Section 5.

2. Literature Review

Firms that are involved in international-business transactions should always employ the best model to estimate the optimal hedge ratio. A perfect hedge in which the loss (profit) in the unhedged position is completely offset by the profit (loss) in the hedged position may not occur in real-life situations. (Note 1) Therefore, firms will have greater concern about minimising the variance of the rate of return in the hedged position to avoid the adverse effect of exchange-rate changes. The estimation of a minimum-variance hedge ratio depends on the econometric model employed to estimate it (Ghosh, 1993). According to Wang et al. (2015), given that numerous sophisticated estimation methods have been utilised aside from OLS estimation to estimate the hedge ratio, the best estimation method is still unclear. However, Lence (1995), Lien et al. (2002), and Moosa (2011) find that using a simple econometric model to estimate the hedge ratio can provide similar results to those obtained with sophisticated ones. Alexander and Barbosa (2007) find that neither a complex model (such as time-varying conditional covariance), nor the error-correction model (ECM) can outperform the simple OLS model. Copeland and Zhu (2006) and Alexander and Barbosa (2007) also argue that there is no value added when using a sophisticated model to estimate the hedge ratio compared with simple OLS. In fact, according to Moosa (2003a), the success and failure of estimating hedging effectiveness depends on the correlation between the price of the unhedged position and the price of the hedged instrument, not on model specifications.

According to Ederington (1979), the relationship between cash price and future price is represented by a regression model, and a slope coefficient represents the hedge ratio with the objective of minimising the risk of the portfolio (risk-minimising hedge ratio). From a theoretical point of view, this optimal hedge ratio with the objective of minimising the variance of the hedged portfolio is a form of an expected-utility maximisation framework (Johnson, 1960; Ederington, 1979; Myers & Thompson, 1989, Lien & Tse, 2002). This minimum-variance framework is widely used because it is simple to compute and easy to understand (Chen et al., 2003).

The first problem is related to model specification. The conventional OLS model that uses levels or changes in the exchange rates (the unhedged asset such as a spot rate being a dependent variable and the hedged asset such as a forward or futures rate being the independent variable) has been widely used in the literature (Ederington, 1979; Junkus & Lee, 1985; Malliaris & Urrutia, 1991; Benet, 1992). However, the problem arises in determining which of the specifications (price level or price change) is more appropriate than the other to estimate the hedge ratio. For example, Witt et al. (1987) support the price-level model, whereas Hill and Schneeweis (1981) and Wilson (1983) support the price-change (return) model. Ghosh (1993, 1995, 1996) argues that these methods are misspecified, as using a price-level hedge ratio ignores short-term dynamics, whereas using a price-changes (return) hedge ratio ignores long-term relationships. Ghosh added an error-correction term to improve the model, as the first-difference model ignores the long-term relationship implied by the error-correction term. In addition, he argues that the omission of a cointegration relationship between variables (spot and forward rates) represented by the error-correction term produces a smaller hedge ratio than the optimal ratio. Lien (1996) was the first to prove this mathematically by showing that when estimating the hedge ratio using a first-difference model, agents will be under-hedged.

The use of the ECM of Engle and Granger (1987) for estimating the optimal hedge ratio for corn, soybeans, and wheat is found in Myers and Thompson (1989). Moreover, Chou et al. (1996) find that hedging under the ECM model outperforms the conventional model for Nikkei spot and futures indices. In the literature, OLS is criticised as being inappropriate to use in estimating the hedge ratio, due to the serial correlation and heteroskedasticity in the error term arising from the relationship between spot and forward rates (Hill & Schneeweis, 1981; Herbst et al., 1993; Kenourgios et al., 2008).

The second problem that arises in the literature relates to the dynamics of the hedge ratio. It is associated with the view of whether the hedge ratio is constant or changing over time and the question of whether a conditional or unconditional probability distribution (moments) should be used to estimate it. (Note 2) For example, the static hedge ratio based on unconditional moments has been studied by Ederington, (1979), Howard and D'Antonio (1984), Benet (1992), Ghosh (1993, 1995, 1996), and Kolb and Okunev (1992, 1993). Alternatively, a dynamic (changing) hedge ratio based on conditional moments such as the ARCH and GARCH family of models—in which it is assumed that covariance and variance of returns are time-varying—has been studied in Cecchetti et al. (1988), Baillie and Myers (1991), Kroner and Sultan (1993), Sephton (1993), Brooks and Chong (2001), Hatemi-J and Roca (2006), Park and Jei (2010), and Hatemi-J and El-Khatib (2012). However, time-varying models also receive criticism, as they introduce too much noise that affects cost-effective hedges (Copeland & Zhu, 2006; Alexander & Barbosa, 2007).

In this paper, we do not investigate this dynamic aspect of the hedge ratio; instead, the scope is limited to comparing different empirical-model specifications and estimation methods that minimise the variance of the hedge ratio, as in Moosa (2011), who shows that financial-econometrics models used to estimate the hedge ratio fail to add value in improving the effectiveness of the hedge. (Note 3) Therefore, he suggests that a naïve hedge ratio of 1 provides similar results to the sophisticated econometric models. The inferences that Moosa obtains suggest that the dominance of the naïve hedge ratio are consistent with those of Jong et al. (1995), Jong et al. (1997), Grant and Eaker (1989), Maharaj et al. (2008), Alexander et al. (2013), and Wang et al. (2015). (Note 4).

3. Methodology

Money-market hedging is based on the covered interest parity (CIP) condition, which suggests that the difference between the spot and the forward rate is related to the interest-rate differential between two countries. CIP implies that a high-interest currency sells at a forward discount, and a low-interest currency sells at a forward premium. In an efficient market in which transaction costs are absent, the interest-rate differential is equal to the forward spread as equilibrium is achieved in the money market (Shapiro, 2010). CIP confirms that the return on unhedged local interest-rate investment and hedged foreign-currency investment will be equal. Therefore, the return differential becomes zero. When such a condition does not hold, an arbitrage opportunity arises by borrowing one currency and investing in the other.

Money-market hedging consists of borrowing in the domestic currency and lending in the foreign currency, or vice versa, to cover expected receivables and payables. This process creates an implicit forward rate $\bar{F}$ (the price of a synthetic forward contract). Therefore, the forward contract can be replicated by money-market hedging, given that CIP holds (Khoury & Chan, 1988). Given that the base currency is x and the foreign currency is y, we can use money-market hedging for payables and receivables as follows. Suppose that a firm has payables of K in foreign currency y due at time $t+1$:

1) At time t, the company borrows the present value of amount K discounted at foreign interest rate i^* from a local bank in the domestic currency. This is $KS_t/(1+i^*)$.

2) The domestic-currency amount is then converted into the foreign currency y at S_t (to obtain the present value of the foreign currency payable) that will be invested at i^*. The amount from this investment is used to cover the payables due at $t+1$.

3) At $t+1$, the domestic-currency loan becomes due, so the firm should repay the principal and interest KS_t $(1+i)/(1+i^*)$.

4) Given that we pay KS_t $(1+i)/(1+i^*)$ units of x to obtain K units of y, hence, the implicit forward rate is

$$\bar{F}_t = \frac{KS_t(1+i)/(1+i^*)}{K} = S_t\ (1+i)/(1+i^*).$$

From the above operations, no matter what value S_{t+1} is, the firm realises in advance the domestic-currency value of payables because they will act on $\bar{F}_t$. Therefore, the firm knows in advance how much they will pay in the case of payables, and if $\bar{F}_t < S_{t+1}$, this means that the uncovered interest-rate parity ($\bar{F}_t = S_{t+1}$) has been violated and the hedge decision will be the best decision. However, if $\bar{F}_t > S_{t+1}$, no hedge will be the best decision. Finally, if $\bar{F}_t = S_{t+1}$, the decision on whether to hedge or not to hedge will yield the same result. When we compare the implicit forward rate with the forward rate, if $\bar{F} < F$, this means that a money-market hedge is better than a forward hedge and CIP does not hold. However, if $F = \bar{F}$, then CIP holds and there is no difference between hedging by forward contract and hedging by the money market. One should note that money-market hedging consists of many transactions and could be costly. Therefore, it should only be used if there is no forward contract.

In terms of receivables, we would have the same operations except that the decision would be the opposite. The firm knows in advance how much they will receive, and if $\bar{F}_t < S_{t+1}$, this means that the uncovered interest-rate parity ($\bar{F}_t = S_{t+1}$) has been violated and the no-hedge decision will be the best decision. However, if $\bar{F}_t > S_{t+1}$, hedging will be the best decision. Finally, if $\bar{F}_t = S_{t+1}$, the decision on whether to hedge or not to hedge will yield the same result. Table 1 summarises the money-market hedging decision for both payables and receivables.

Table 1. Money-market hedging decision for both payables and receivables

Price condition	In the case of payables	In the case of receivables
$\bar{F}_t < S_{t+1}$	Hedge	Not to hedge
$\bar{F}_t > S_{t+1}$	Not to hedge	Hedge
$\bar{F}_t = S_{t+1}$	Same result	Same result

Source: Moosa (2003b).

Al-Loughani and Moosa (2000) find that there is no difference between hedging by forward contract and hedging by money-market hedge when they examine whether the CIP holds or not indirectly. They find that the CIP does hold and these two hedging techniques are equivalent to each other, as both of them reduce the variability of the return.

Cross-currency hedging can be implemented by either taking a position on another foreign-currency derivative or another foreign-currency spot rate. When a derivative instrument such as a forward or an option is unavailable for a certain foreign currency y, the firm can take the position of buying or selling a derivative for another foreign currency z, which has an exchange rate against the domestic currency $F(x/z)$, that is correlated with the original exchange rate $S(x/y)$. For example, if company A has foreign exposure of currency y but there is no derivative instrument for currency y, then this firm can take a position of buying or selling derivatives for the z currency, based on the strong correlation between $S(x/y)$ and $F(x/z)$.

Another technique for cross-currency hedging instead of using currency derivative is when the firm takes a spot position on another foreign currency z. For example, suppose that a firm has a short position on currency y, it can hedge the position by taking a long position on a third currency z (given that the foreign-currency exchange rate $S(x/y)$ and the third-currency exchange rate $S(x/z)$ are highly correlated), and vice versa. For example, if a firm has payables (short position) in currency y, it can buy (long position) currency z. Therefore, if currency y appreciates, the third-currency exchange rate $S(x/z)$ will also rise, which means that the loss that would occur from currency y is offset by the profit from currency z. This technique relies on the spot market, not the forward market. Schwab and Lusztig (1978) argue that if the transacting partners aim to minimise the risk and their concern is a nominal return and cost, a mix of the two currencies for the two parties should be used; if the concern is the real return and cost based on the reference basket, a third currency should be used.

As stated above, we follow Moosa (2011) in estimating the optimal hedge ratio. We use nine different econometric models for comparison. After that, we measure the effectiveness of the hedge ratio by examining the effectiveness of the no-hedge decision against the hedge decision where we test the equality of variances for the returns under each position.

$$H_0: \sigma^2(R_U) = \sigma^2(R_H) \tag{1}$$

$$H_a: \sigma^2(R_U) > \sigma^2(R_H) \tag{2}$$

where $\sigma^2(R_U)$ is the variance rate of the return under the no-hedge decision and $\sigma^2(R_H)$ is the variance of the rate of return under the hedge decision. The test statistic is

$$VR = \frac{\sigma^2(R_U)}{\sigma^2(R_H)} \geq F_\alpha(n-1, n-1) \tag{3}$$

which will be accompanied by the variance reduction

$$VD = 100\left[1 - \frac{\sigma^2(R_H)}{\sigma^2(R_U)}\right] = 100\left[1 - \frac{1}{VR}\right] \tag{4}$$

First-difference model using (OLS)

The conventional hedge ratio under OLS is estimated by

$$\Delta p_{u,t} = \alpha + h\Delta p_{a,t} + \varepsilon_t. \tag{5}$$

This OLS model is called 'conventional' as it uses historical data, and the R^2 obtained from the regression represents the effectiveness of the hedge. We use the OLS because of its simplicity, and because it is widely used among researchers. The OLS model can also be estimated using level data instead of first differences as

$$p_{u,t} = \alpha + hp_{a,t} + \varepsilon_t \tag{6}$$

First-difference model using Cochrance-Orcutt method with AR(1)

The Cochrance-Orcutt method overcomes the problem of serial correlation in the residuals—if it existed. This is because if we run a simple OLS estimation and there is serial correlation, our OLS will still provide the unbiased estimator but will not be the best linear unbiased efficient estimator (BLUE) (Brooks, 2014). In addition, the confidence interval and hypothesis testing become misleading, as they will depend on incorrect standard errors estimated from the OLS. This method consists of two iterative steps, which are (i) estimating first-order correlation τ; and (ii) estimating the generalised least squares (GLS) equation using $\hat{\tau}$ (Studenmund, 2011; Hill et al., 2011). Suppose that there is an equation similar to Equation (5). First, we run a regression of lagged errors with AR(1)

$$\varepsilon_t = \tau\varepsilon_{t-1} + u_t \qquad -1< \tau <1 \tag{7}$$

Then, the estimated $\hat{\tau}$ from Equation (7) is multiplied by Equation (5) and used in a lagged version of the equation as

$$\hat{\tau}\Delta p_{u,t-1} = \hat{\tau}b_0 + \hat{\tau}h\Delta p_{a,t-1} + \hat{\tau}\varepsilon_{t-1} \tag{8}$$

Subtracting Equation (8) from Equation (5) we get

$$\Delta p_{u,t} - \hat{\tau}\Delta p_{u,t-1} = \alpha(1-\hat{\tau}) + h\left(\Delta p_{a,t} - \hat{\tau}\Delta p_{a,t-1}\right) + u_t \tag{9}$$

or it can be written in this form:

$$\Delta p^*_{u,t} = \alpha^* + h\Delta p^*_{a,t} + u^*_t \tag{10}$$

The use of an autoregressive model means that the dependent variable is related to its lag value. Coffey et al. (2000) use the Cochrance-Orcutt method in estimating the hedge ratio for some grains that are used to feed livestock.

Maximum-likelihood method with an MA (1)

A moving-average process combines both the average of the current period's random error and the previous period's random error (Gujarati, 2003). It is used whenever serial correlation exists. The error process is

$$\varepsilon_t = \theta u_{t-1} + u_t \tag{11}$$

This model suggests that error term follows a first-order moving average, and this process is short-lived with no memory of previous levels.

First-difference model using instrumental variables (IV) with an AR (1)

Instrumental variable (IV) is also used to estimate the hedge ratio. Given that the OLS is based on the assumption that the independent variable and the error term are uncorrelated, this means that the independent variable is exogenous. However, if the covariance between the independent variable and the error term is not equal to zero, the independent variable becomes endogenous. According to Wooldridge (2009), there are three causes for endogeneity (i) omitted variables; (ii) error in the variables; and (iii) measurement error in the independent variable. As a result, OLS becomes unreliable, because the coefficient is biased and inconsistent. To solve this problem, IV is proposed. For example, if we have omitted a variable from the regression model, this omitted variable will definitely affect the error term, and if at the same time this omitted variable is correlated with $\Delta p_{a,t-1}$, OLS will be biased and inconsistent. Under IV, we add a new variable that is uncorrelated with the error term but is correlated with $\Delta p_{a,t-1}$. In this case the IV becomes consistent. The use of IV to estimate the hedge ratio of the returns of securities listed in the NYSE and the ASE was used by Scholes and Williams (1977).

First-difference model using a nonlinear quadratic specification

We also estimate the hedge ratio using a nonlinear regression first-difference model as

$$\Delta p_{u,t} = \alpha + h\Delta p_{a,t} + \gamma\Delta p^2_{a,t} + \varepsilon_t \tag{12}$$

where we have a linear parameter γ and a squared term of the independent variable $p^2_{a,t}$. Such a model was proposed by Chow et al. (2000) in their study on the AUD, GBP, CAD, DEM, FRF, and JPY to capture the nonlinear relationship between spot and forward exchange rates.

First-difference model using a linear error-correction model (ECM)

Suppose that there is linear combination in the cointegration regression as in Equation (6)

$$p_{u,t} = \alpha + hp_{a,t} + \varepsilon_t$$

that is $p_{u,t}$ and $p_{a,t}$ to be cointegrated $\varepsilon_t \sim I(0)$ (Engle and Granger 1987). In other words, the residuals are stationary and the two series do not diverge too far from each other. (Note 5) This suggests that Equation (8) is misspecified, because there is a long-run or equilibrium relationship between the two variables. Therefore, it would be better to respecify the model using an ECM to take into account short-term dynamics as in

$$\Delta p_{u,t} = \alpha + \sum_{i=1}^{n}\beta_i\Delta p_{u,t-i} + h\Delta p_{a,t} + \sum_{i=1}^{n}\gamma_i\Delta p_{a,t-i} + \theta\varepsilon_{t-1} + \zeta_t \tag{13}$$

where γ_i defines the short-term relationship between $\Delta p_{u,t}$ and $\Delta p_{a,t-i}$; ε_{t-1} is an error-correction term which is the lagged value of the empirical residual of a regression of $p_{u,t}$ on $p_{a,t}$ (which represents the long-term relationship or the cointegrating regression); θ, which is the coefficient on the error-correction term, is a measure of the speed of adjustment to deviations from the long-run equilibrium condition. For a valid ECM, θ must be significantly negative. If ε_{t-1} is positive, this means that $p_{u,t-1}$ is above the equilibrium; it is too high, and it should fall in the next period so that the equilibrium error is corrected. Lien and Luo (1993) use an ECM as in Equation (13) in estimating the hedge ratio for a number of foreign currencies and stock-index futures. In addition, Alexander (1999) uses as ECM as in Equation (13) to estimate the optimal hedge ratio for equity-index tracking and hedging of international-equity portfolios. The ECM was also used by Hatemi-J and Roca (2010) in their study on the US and UK equity markets.

First-difference model using a nonlinear error-correction model (NECM)

We have NECM with A(L) and B(L) which represent lag polynomials.

$$\Delta p_{u,t} = A(L)\Delta p_{u,t-i} + B(L)\Delta p_{a,t} + \sum_{i=1}^{k} \gamma_i \varepsilon_{t-i}^{i} + \zeta_t \tag{14}$$

This model—proposed by Escribano (1978) to model economic variables that have statistical properties differing from classical linear time series properties—was used empirically by Hendry and Eriscon (1991) to analyse the demand for money in the United Kingdom over the period 1878 to 1970. Chow et al. (2000) also used such a model to capture the nonlinear relationship between the spot and forward rates for a number of currencies.

First-difference model using an autoregressive distributed lag ARDL (1,1)

Autoregressive distributed lag (ARDL) uses a lagged value of both the dependent variable and the independent variable. According to Hill et al. (2011), the ARDL has an advantage in that it eliminates serial correlation in the errors. The hedge ratio is estimated using the following model:

$$\Delta p_{u,t} = \sum_{i=1}^{m} \alpha_i \Delta p_{u,t-i} + \sum_{i=0}^{n} \beta_i \Delta p_{a,t-i} + \zeta_t \tag{15}$$

where the hedge ratio is represented by the long-run coefficient β_0. The number of lagged m and n of the model is based on selection criteria such as the Akaike Information Criterion (AIC) and Schwarz Criterion (SC).

First-difference model using an autoregressive distributed lag ARDL (1,1)

Again, the ARDL in Equation (15) is used here, but the hedge ratio is differently calculated using an impact coefficient as

$$h = \frac{\sum_{i=0}^{n} \beta_i}{1 - \sum_{i=1}^{m} \alpha_i} \tag{16}$$

This hedge ratio can also be called a long-run hedge ratio.

4. Data and Empirical Results

We use a sample of end-of-the-month data for the spot exchange rate and the one-month forward rate of the Kuwaiti dinar (KWD), Saudi riyal (SAR), Emirati dirham (AED), Bahraini dinar (BHD) and Qatari riyal (QAR) as base currencies against the US dollar (USD), British pound (GBP), Swiss franc (CHF), and Japanese yen (JPY). The data are obtained from Thomson Reuters' DataStream and the International Monetary Fund's International Financial Statistics CD-ROM for the period 1:2000 to 11:2011. We assign x to the base currency, y to the exposure currency and z for a third currency that is a cross-currency. We assume a domestic firm in the GCC with payables of 100 in the foreign currency (exposure currency y). Table 2 summarises the sample data period for each currency, depending on availability (Note 6).

Table 2. Sample data period for each currency against the CHF, GBP, and JPY

Base Currency (x)	Period (End of the Month)	Number of Observations
KWD	1:2000 - 11:2011	143
SAR	1:2000 - 11:2011	143
AED	5:2000 - 11:2011	139
QAR	7:2004 - 11:2011	89
BHD	12:2006 -11:2011	60

For the money-market hedging, the correlation between $\Delta s(x/y)$ and $\Delta \bar{f}(x/y)$ determines the effectiveness of money-market hedging, whereas the correlation between the exposure-currency exchange rate $\Delta s(x/y)$ and the third-currency exchange rate $\Delta s(x/z)$ determines the effectiveness of cross-currency hedging.

Tables 3 to 13 present the results of estimating the hedge ratio using different econometric models for both money-market hedging and cross-currency hedging. They report goodness of fit, t statistic, variance ratio (VR), and variance reduction (VD). (Note 7) Money-market hedging results (in Tables 3 to 7) show that a perfect hedge is obtained for all of the econometric models, as VD is almost equal to 99 percent. The results also show that a hedge ratio of 1 (naïve model) is obtained. (Note 8) Cross-currency hedging results (in Tables 8 to 12) show that different econometric models under cross-currency hedging produce a hedge ratio that is almost the same in each model, but neither close to unity nor significant in several currency combinations. Comparing the hedge ratio with money-market hedging, we notice that currency combinations under cross-currency hedging do not reduce the variance significantly (no perfect hedge). This is attributed either to no relationship or a weak relationship between the exposure-currency exchange rate $\Delta s(x/y)$ and the third-currency exchange rate $\Delta s(x/z)$.

On the other hand, the perfect hedge for all currency combinations achieved under money-market hedging is attributed to the strong relationship between the spot rate and the implicit forward rate. The results suggest that money-market hedging is preferred to cross-currency hedging. In addition, they suggest that the sophistication of the econometric models used to estimate the hedge ratio does not yield any difference compared with the simple OLS model. The results are approximately the same. The rest of the Tables and Figures are included at the end of this paper.

5. Conclusion

In this paper, we examined the effectiveness of different econometric models in minimising the variance of the hedge ratio for the GCC currencies under money-market hedging and cross-currency hedging. The aim of this examination was to determine whether different model specifications and estimation methods yield different effectiveness results. In other words, does the sophistication of the model improve the effectiveness of the hedge? Our results showed that these econometric models fail either to add value or to improve the effectiveness of the hedge. This implies that there is no need for a sophisticated econometric model to estimate the hedge ratio, because what matters is correlation.

Table 3. Money-market hedging—KWD

	x	*y*	R^2	*h*	*t statistic*	VR	VD (%)
OLS							
	KWD	CHF	0.997	1.019*	211.042	71.510*	98.602
	KWD	GBP	0.987	1.056*	103.125	38.608*	97.410
	KWD	JPY	0.987	1.046*	104.663	53.037*	98.115
Cochrance-Orcutt							
	KWD	CHF	0.986	1.005*	101.993	72.468*	98.620
	KWD	GBP	0.977	0.998*	76.500	43.020*	97.676
	KWD	JPY	0.984	1.000*	95.148	60.121*	98.337
MLE							
	KWD	CHF	0.986	1.004*	101.966	72.466*	98.620
	KWD	GBP	0.977	0.998*	76.995	43.026*	97.675
	KWD	JPY	0.984	0.999*	96.521	60.121*	98.336
IV							
	KWD	CHF	0.978	0.910*	14.144	44.038*	97.729
	KWD	GBP	0.949	1.173*	1.173	19.638*	94.908
	KWD	JPY	0.983	1.013*	19.840	59.464*	98.318
Quadratic							
	KWD	CHF	0.986	1.008*	93.720	72.457*	98.620
	KWD	GBP	0.977	1.002*	75.539	43.073*	97.678
	KWD	JPY	0.983	0.999*	90.864	60.122*	98.337
Linear ECM							
	KWD	CHF	0.987	1.008*	102.119	72.465*	98.620
	KWD	GBP	0.979	0.998*	77.860	43.013*	97.675
	KWD	JPY	0.985	1.006*	92.903	59.938*	98.332
Nonlinear ECM							
	KWD	CHF	0.988	1.007*	102.656	72.470*	98.620

	KWD	GBP	0.979	0.996*	77.835	42.973*	97.673
	KWD	JPY	0.985	1.001*	91.025	60.116*	98.337
ARDL							
	KWD	CHF	0.986	1.007*	98.757	72.469*	98.620
	KWD	GBP	0.978	1.001*	76.930	43.067*	97.678
	KWD	JPY	0.984	1.004*	90.540	60.036*	98.334
ARDL (long-run)							
	KWD	CHF	0.986	1.024*	43.385	70.945*	98.590
	KWD	GBP	0.978	1.045*	41.678	40.226*	97.514
	KWD	JPY	0.984	1.034*	42.650	56.134*	98.219

* Significant at the 5% level.

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Notes

Note 1. In principle, it is possible to obtain a perfect hedge if the prices of two positions are perfectly correlated and the optimal hedge ratio (in this case a hedge ratio of 1) is used. In practice firms are not entirely risk averse, in which case they do not use a hedge ratio of 1, which means that the hedge is not perfect.

Note 2. Given that the hedge ratio equals $h = \frac{Cov(R_U,R_A)}{Var(R_A)}$, time-variant or invariant is related to $Cov(R_U, R_A)$ and $Var(R_A)$.

Note 3. We do not compare a static hedge ratio with a dynamic hedge ratio; instead, we examine different techniques for estimating the hedge ratio that range from conventional models to sophisticated ones.

Note 4. Brooks et al. (2006) argue that a naïve hedge ratio of 1 becomes optimal only if we have perfect correlation between spot and futures, and that it is constant over time.

Note 5. If there is a unit root and both series can be cointegrated.

Note 6. We encountered several limitations related to data availability. This problem is normal for researchers working with data for developing countries. For example, Oman is excluded from this study because of inaccurate exchange-rate data and the unavailability of interest rates. In addition, the sample period for each country in this study is not exactly the same because of a lack of interest-rate data for most of the countries at the time of collecting the data.

Note 7. According to Malliaris and Urrutia (1991), the R^2 obtained from the first-difference model can be used for the effectiveness of the hedge, because the R^2 will be equal to the hedge ratio; whereas, Lindahl (1991) shows that the Mean Absolute Difference (MAD) can be used for the effectiveness of the hedge for risk-minimising the portfolio. Moreover, Graff et al. (1997) show that the Root Mean Square Percentage Error (RMSPE) can be used for the effectiveness of the hedge. In this paper, we use R^2, VR, and VD for the effectiveness of the hedge.

Note 8. The naïve model assumes that the hedge ratio is always a negative one. This means taking an amount equal in value to the spot position, but in the opposite position to the financial derivative or asset (long AUD 1 and short AUD 1, or vice versa).

Appendix

Table 4. Money-market hedging—SAR

	x	*y*	R^2	*h*	*t statistic*	VR	VD (%)
OLS							
	SAR	CHF	0.998	1.016*	256.430	145.068	99.311
	SAR	GBP	0.994	1.028*	151.293	101.231	99.012
	SAR	JPY	0.991	1.054*	127.611	99.477	98.995
Cochrance-Orcutt							
	SAR	CHF	0.994	0.994*	148.104	154.284*	99.352
	SAR	GBP	0.991	1.007*	119.764	105.141*	99.049
	SAR	JPY	0.993	1.012*	141.149	123.604*	99.191
MLE							
	SAR	CHF	0.993	0.993*	147.756	154.296*	99.351
	SAR	GBP	0.990	1.007*	120.821	105.144*	99.048
	SAR	JPY	0.992	1.011*	135.675	123.654*	99.191
IV							
	SAR	CHF	0.992	0.951*	27.876	119.543*	99.163
	SAR	GBP	0.991	1.014*	36.071	104.832*	99.046
	SAR	JPY	0.991	1.043*	27.768	108.983*	99.082

Quadratic							
	SAR	CHF	0.994	0.993*	145.976	154.271*	99.352
	SAR	GBP	0.991	1.005*	120.704	105.034*	99.048
	SAR	JPY	0.992	1.010*	130.819	123.684*	99.191
Linear ECM							
	SAR	CHF	0.994	0.998*	146.804	154.131*	99.351
	SAR	GBP	0.991	1.008*	121.452	105.160*	99.049
	SAR	JPY	0.993	1.016*	133.916	123.121*	99.188
Nonlinear ECM							
	SAR	CHF	0.994	0.998*	145.897	154.080*	99.351
	SAR	GBP	0.991	1.008*	120.997	105.160*	99.049
	SAR	JPY	0.993	1.016*	132.871	123.119*	99.188
ARDL							
	SAR	CHF	0.994	0.997*	148.744	154.240*	99.352
	SAR	GBP	0.991	1.009*	118.434	105.162*	99.049
	SAR	JPY	0.993	1.014*	138.986	123.354*	99.189
ARDL (long-run)							
	SAR	CHF	0.994	1.017*	61.623	143.097*	99.301
	SAR	GBP	0.991	1.022*	70.324	103.431*	99.033
	SAR	JPY	0.993	1.044*	39.187	108.018*	99.074

* Significant at the 5% level.

Table 5. Money-market hedging—AED

	x	*y*	R^2	*h*	*t statistic*	VR	VD (%)
OLS							
	AED	CHF	0.998	0.992*	248.258	201.256*	99.503
	AED	GBP	0.988	1.031*	108.371	100.768*	99.008
	AED	JPY	0.993	1.018*	143.840	158.724*	99.370
Cochrance-Orcutt							
	AED	CHF	0.996	0.992*	209.815	200.688*	99.502
	AED	GBP	0.992	1.004*	131.464	100.440*	99.004
	AED	JPY	0.995	1.008*	185.717	166.189*	99.398
MLE							
	AED	CHF	0.995	0.993*	186.950	201.789*	99.504
	AED	GBP	0.991	1.006*	129.906	100.948*	99.009
	AED	JPY	0.994	1.005*	171.785	166.747*	99.400
IV							
	AED	CHF	0.990	0.929*	24.059	101.290*	99.013
	AED	GBP	0.987	1.075*	29.488	78.314*	98.723
	AED	JPY	0.993	0.964*	30.584	136.585*	99.268
Quadratic							
	AED	CHF	0.995	1.000*	163.120	203.205*	99.507
	AED	GBP	0.991	1.014*	121.989	102.386*	99.023
	AED	JPY	0.994	1.000*	149.347	167.504*	99.403
Linear ECM							
	AED	CHF	0.996	0.999*	190.693	203.168*	99.508
	AED	GBP	0.992	1.011*	128.618	101.974*	99.019
	AED	JPY	0.996	1.010*	167.955	165.222*	99.395
Nonlinear ECM							
	AED	CHF	0.997	0.998*	189.857	203.084*	99.508
	AED	GBP	0.992	1.011*	127.600	101.982*	99.019
	AED	JPY	0.996	1.010*	166.626	165.264*	99.395
ARDL							
	AED	CHF	0.996	0.999*	190.026	203.194*	99.508
	AED	GBP	0.992	1.012*	126.035	102.020*	99.020

	AED	JPY	0.996	1.009*	46.338	165.456*	99.396
ARDL (long-run)							
	AED	CHF	0.996	1.036*	46.553	160.827*	99.378
	AED	GBP	0.992	1.049*	50.571	93.948*	98.936
	AED	JPY	0.996	1.036*	43.459	138.533*	99.278

* Significant at the 5% level.

Table 6. Money-market hedging—QAR

	x	*y*	R^2	*h*	*t statistic*	VR	VD (%)
OLS							
	QAR	CHF	0.995	1.038*	135.890	40.069	97.504
	QAR	GBP	0.986	1.092*	79.500	28.747	96.521
	QAR	JPY	0.997	1.049*	168.700	19.140	94.775
Cochrance-Orcutt							
	QAR	CHF	0.978	0.999*	54.745	44.624*	97.759
	QAR	GBP	0.971	1.019*	53.404	33.921*	97.052
	QAR	JPY	0.955	0.979*	42.393	21.666*	95.384
MLE							
	QAR	CHF	0.978	1.004*	56.895	44.296*	97.742
	QAR	GBP	0.970	1.020*	53.945	33.916*	97.051
	QAR	JPY	0.955	0.987*	44.469	21.573*	95.364
IV							
	QAR	CHF	0.973	0.918*	12.845	37.203*	97.312
	QAR	GBP	0.969	0.984*	19.855	32.784*	96.950
	QAR	JPY	0.951	0.993*	10.101	21.477*	95.344
Quadratic							
	QAR	CHF	0.978	0.990*	61.231	44.951*	97.775
	QAR	GBP	0.971	1.011*	52.187	33.873*	97.048
	QAR	JPY	0.955	0.974*	42.690	21.690*	95.390
Linear ECM							
	QAR	CHF	0.980	0.999*	56.631	44.628*	97.759
	QAR	GBP	0.974	1.009*	53.868	33.846*	97.045
	QAR	JPY	0.961	0.984*	45.026	21.612*	95.373
Nonlinear ECM							
	QAR	CHF	0.981	1.005*	56.247	44.281*	97.742
	QAR	GBP	0.975	1.001*	53.455	33.637*	97.027
	QAR	JPY	0.967	0.987*	48.187	21.578*	95.366
ARDL							
	QAR	CHF	0.981	1.002*	57.432	44.487*	97.752
	QAR	GBP	0.972	1.019*	50.944	33.923*	97.052
	QAR	JPY	0.963	0.977*	46.338	21.675*	95.386
ARDL (long-run)							
	QAR	CHF	0.981	1.047*	50.116	38.562*	97.407
	QAR	GBP	0.972	1.057*	43.999	32.346*	96.908
	QAR	JPY	0.963	1.041*	43.459	19.616*	94.902

* Significant at the 5% level.

Table 7. Money-market hedging—BHD

	x	*y*	R^2	*h*	*t statistic*	VR	VD (%)
OLS							
	BHD	CHF	0.998	1.025*	180.410	289.865*	99.655
	BHD	GBP	0.996	1.061*	120.257	79.451*	98.741
	BHD	JPY	0.999	1.002*	222.024	192.74*	98.998
Cochrance-Orcutt							
	BHD	CHF	0.996	1.016*	149.111	293.144*	99.659
	BHD	GBP	0.990	0.999*	70.538	90.174*	98.891
	BHD	JPY	0.992	1.010*	80.126	125.086*	99.201
MLE							
	BHD	CHF	0.996	1.016*	146.640	293.388*	99.659
	BHD	GBP	0.989	1.003*	70.045	90.987*	98.900
	BHD	JPY	0.992	1.010*	80.300	125.091*	99.200
IV							
	BHD	CHF	0.995	0.977*	26.657	197.000*	99.492
	BHD	GBP	0.988	1.049*	31.861	85.360*	98.828
	BHD	JPY	0.991	0.984*	36.293	115.877*	99.137
Quadratic							
	BHD	CHF	0.997	1.019*	127.759	293.791*	99.660
	BHD	GBP	0.990	1.011*	68.572	92.390*	98.918
	BHD	JPY	0.992	1.000*	74.441	123.784*	99.192
Linear ECM							
	BHD	CHF	0.997	1.017*	137.840	293.581*	99.659
	BHD	GBP	0.992	1.000*	74.810	90.257*	98.892
	BHD	JPY	0.993	1.012*	83.084	124.967*	99.200
Nonlinear ECM							
	BHD	CHF	0.998	1.020*	133.879	293.710*	99.660
	BHD	GBP	0.993	0.992*	74.230	87.415*	98.856
	BHD	JPY	0.995	1.021*	94.216	123.070*	99.187
ARDL							
	BHD	CHF	0.997	1.021*	135.127	293.416*	99.659
	BHD	GBP	0.991	1.007*	74.242	91.708*	98.910
	BHD	JPY	0.992	1.011*	81.984	125.051*	99.200
ARDL (long-run)							
	BHD	CHF	0.997	1.060*	48.080	197.765*	99.494
	BHD	GBP	0.991	1.055*	43.083	82.732*	98.791
	BHD	JPY	0.992	1.043*	51.981	110.330*	99.094

* Significant at the 5% level.

Table 8. Cross-currency hedging—KWD

	x	*y*	*z*	R^2	*h*	*t statistic*	VR	VD (%)
1) OLS								
	KWD	CHF	JPY	0.068	0.291*	3.185	1.072	6.756
	KWD	CHF	GBP	0.099	0.356*	3.931	1.110	9.941
	KWD	GBP	JPY	0.001	-0.020	0.001	1.000	0.000
	KWD	GBP	CHF	0.163	0.324*	3.931	1.190	15.972
	KWD	JPY	CHF	0.068	0.232*	3.185	1.072	6.756
	KWD	JPY	GBP	0.000	0.000	0.001	1.000	0.000
2) Cochrance-Orcutt								
	KWD	CHF	JPY	0.078	0.311*	3.372	1.072	6.725
	KWD	CHF	GBP	0.175	0.512*	5.357	1.194	16.277
	KWD	GBP	JPY	0.005	-0.021	-0.270	1.001	0.051
	KWD	GBP	CHF	0.160	0.321*	5.128	1.194	16.282
	KWD	JPY	CHF	0.078	0.248*	3.383	1.072	6.726

	KWD	JPY	GBP	0.005	-0.038	-0.405	1.000	0.038
3) MLE								
	KWD	CHF	JPY	0.083	0.316*	3.476	1.072	6.708
	KWD	CHF	GBP	0.179	0.514*	5.431	1.194	16.275
	KWD	GBP	JPY	0.004	-0.016	-0.213	1.000	0.049
	KWD	GBP	CHF	0.163	0.324*	5.205	1.194	16.283
	KWD	JPY	CHF	0.078	0.247*	3.371	1.072	6.729
	KWD	JPY	GBP	0.004	-0.031	-0.333	1.000	0.048
4) IV								
	KWD	CHF	JPY	0.063	0.480*	1.313	1.041	3.912
	KWD	CHF	GBP	0.151	0.515*	1.404	1.194	16.274
	KWD	GBP	JPY	0.000	-0.029	-0.137	1.000	0.042
	KWD	GBP	CHF	0.139	0.254*	1.384	1.184	15.536
	KWD	JPY	CHF	0.078	0.206*	0.678	1.071	6.671
	KWD	JPY	GBP	0.001	-0.023	-0.333	1.001	0.051
5) Quadratic								
	KWD	CHF	JPY	0.075	0.283*	3.082	1.072	6.751
	KWD	CHF	GBP	0.177	0.533*	5.443	1.194	16.224
	KWD	GBP	JPY	0.024	-0.008	-0.109	1.000	0.033
	KWD	GBP	CHF	0.234	0.401*	6.328	1.181	15.359
	KWD	JPY	CHF	0.117	0.160*	2.119	1.065	6.111
	KWD	JPY	GBP	0.033	0.016	0.172	0.999	-0.088
6) Linear ECM								
	KWD	CHF	JPY	0.100	0.325*	3.509	1.071	6.664
	KWD	CHF	GBP	0.179	0.521*	5.295	1.194	16.263
	KWD	GBP	JPY	0.021	-0.029	-0.373	1.000	0.042
	KWD	GBP	CHF	0.196	0.326*	5.234	1.194	16.282
	KWD	JPY	CHF	0.107	0.249*	3.415	1.072	6.721
	KWD	JPY	GBP	0.019	-0.028	-0.290	1.001	0.051
7) Nonlinear ECM								
	KWD	CHF	JPY	0.121	0.315*	3.409	1.072	6.710
	KWD	CHF	GBP	0.185	0.515*	5.211	1.194	16.273
	KWD	GBP	JPY	0.028	-0.031	-0.404	1.000	0.036
	KWD	GBP	CHF	0.223	0.318*	5.140	1.194	16.277
	KWD	JPY	CHF	0.122	0.243*	3.330	1.072	6.742
	KWD	JPY	GBP	0.019	-0.028	-0.293	1.001	0.050
8) ARDL(1,1)								
	KWD	CHF	JPY	0.089	0.301*	3.112	1.072	6.748
	KWD	CHF	GBP	0.201	0.535*	5.512	1.194	16.218
	KWD	GBP	JPY	0.007	-0.014	-0.172	1.000	0.046
	KWD	GBP	CHF	0.206	0.343*	5.512	1.194	16.222
	KWD	JPY	CHF	0.146	0.222*	3.112	1.072	6.744
	KWD	JPY	GBP	0.057	-0.016	-0.172	1.000	0.044
9) ARDL(1,1) long-run								
	KWD	CHF	JPY	0.089	0.462*	3.415	1.047	4.448
	KWD	CHF	GBP	0.201	0.264*	1.886	1.144	12.614
	KWD	GBP	JPY	0.007	-0.009	-0.059	1.000	0.036
	KWD	GBP	CHF	0.206	0.584*	4.326	1.061	5.713
	KWD	JPY	CHF	0.146	0.159*	1.121	1.065	6.088
	KWD	JPY	GBP	0.057	-0.336	-2.133	1.078	7.204

* Significant at the 5% level.

Table 9. Cross-currency hedging—SAR

	x	*y*	*z*	R^2	*h*	*t statistic*	VR	VD (%)
1) OLS								
	SAR	CHF	JPY	0.118	0.435*	4.320	1.133	11.761
	SAR	CHF	GBP	0.280	0.675*	7.386	1.390	28.041
	SAR	GBP	JPY	0.007	0.082	0.987	1.007	0.691
	SAR	GBP	CHF	0.280	0.415*	7.386	1.380	28.041
	SAR	JPY	CHF	0.118	0.270*	4.320	1.133	11.761
	SAR	JPY	GBP	0.007	0.083	0.987	1.007	0.691
2) Cochrance-Orcutt								
	SAR	CHF	JPY	0.137	0.464*	4.611	1.133	11.710
	SAR	CHF	GBP	0.294	0.673*	7.444	1.390	28.040
	SAR	GBP	JPY	0.017	0.077	0.921	1.007	0.687
	SAR	GBP	CHF	0.280	0.407*	7.215	1.389	28.030
	SAR	JPY	CHF	0.122	0.281*	4.469	1.133	11.741
	SAR	JPY	GBP	0.006	0.075	0.885	1.007	0.684
3) MLE								
	SAR	CHF	JPY	0.142	0.466*	4.733	1.133	11.701
	SAR	CHF	GBP	0.297	0.668*	7.530	1.390	28.038
	SAR	GBP	JPY	0.017	0.083	0.995	1.007	0.691
	SAR	GBP	CHF	0.281	0.410*	7.287	1.390	28.037
	SAR	JPY	CHF	0.123	0.283*	4.485	1.133	11.736
	SAR	JPY	GBP	0.007	0.083	0.979	1.007	0.691
4) IV								
	SAR	CHF	JPY	0.095	0.652*	1.499	1.097	8.856
	SAR	CHF	GBP	0.285	0.668*	2.438	1.390	28.037
	SAR	GBP	JPY	0.005	0.072	0.341	1.007	0.678
	SAR	GBP	CHF	0.287	0.425*	2.327	1.389	28.025
	SAR	JPY	CHF	0.045	0.477*	0.942	1.051	4.848
	SAR	JPY	GBP	0.001	0.138	0.594	1.004	0.400
5) Quadratic								
	SAR	CHF	JPY	0.130	0.443*	4.402	1.133	11.757
	SAR	CHF	GBP	0.313	0.728*	7.910	1.386	27.870
	SAR	GBP	JPY	0.017	0.077	0.923	1.007	0.688
	SAR	GBP	CHF	0.312	0.439*	7.848	1.388	27.949
	SAR	JPY	CHF	0.162	0.242*	3.902	1.132	11.633
	SAR	JPY	GBP	0.052	0.133	1.558	1.005	0.451
6) Linear ECM								
	SAR	CHF	JPY	0.157	0.487*	4.752	1.131	11.595
	SAR	CHF	GBP	0.321	0.725*	7.838	1.387	27.892
	SAR	GBP	JPY	0.037	0.082	0.977	1.007	0.691
	SAR	GBP	CHF	0.344	0.428*	7.824	1.389	28.013
	SAR	JPY	CHF	0.164	0.285*	4.606	1.133	11.724
	SAR	JPY	GBP	0.007	0.080	0.922	1.007	0.689
7) Nonlinear ECM								
	SAR	CHF	JPY	0.165	0.489*	4.742	1.131	11.584
	SAR	CHF	GBP	0.331	0.720*	7.777	1.387	27.920
	SAR	GBP	JPY	0.042	0.092	1.081	1.007	0.682
	SAR	GBP	CHF	0.388	0.445*	8.288	1.387	27.896
	SAR	JPY	CHF	0.176	0.288*	4.651	1.133	11.709
	SAR	JPY	GBP	0.013	0.078	0.897	1.007	0.688
8) ARDL(1,1)								
	SAR	CHF	JPY	0.144	0.449*	4.302	1.133	11.749
	SAR	CHF	GBP	0.308	0.738*	7.812	1.385	27.798
	SAR	GBP	JPY	0.025	0.086	0.999	1.007	0.690
	SAR	GBP	CHF	0.353	0.422*	7.812	1.390	28.034

	SAR	JPY	CHF	0.159	0.269*	4.302	1.133	11.760
	SAR	JPY	GBP	0.028	0.085	0.999	1.007	0.690
9) ARDL(1,1) long-run								
	SAR	CHF	JPY	0.144	0.608*	4.392	1.110	9.901
	SAR	CHF	GBP	0.308	0.444*	3.332	1.329	24.761
	SAR	GBP	JPY	0.025	0.081	0.460	1.007	0.690
	SAR	GBP	CHF	0.353	0.669*	5.057	1.213	17.587
	SAR	JPY	CHF	0.159	0.320*	2.734	1.128	11.361
	SAR	JPY	GBP	0.028	-0.070	-0.466	1.016	1.607

* Significant at the 5% level.

Table 10. Cross-currency hedging—AED

	x	*y*	*z*	R^2	*h*	*t statistic*	VR	VD (%)
1) OLS								
	AED	CHF	JPY	0.120	0.440*	4.310	1.137	12.021
	AED	CHF	GBP	0.287	0.690*	7.394	1.402	28.677
	AED	GBP	JPY	0.006	0.076	0.912	1.006	0.608
	AED	GBP	CHF	0.287	0.415*	7.394	1.402	28.677
	AED	JPY	CHF	0.120	0.273*	4.311	1.137	12.021
	AED	JPY	GBP	0.006	0.079	0.912	1.006	0.608
2) Cochrance-Orcutt								
	AED	CHF	JPY	0.143	0.469*	4.656	1.136	11.970
	AED	CHF	GBP	0.303	0.684*	7.511	1.402	28.674
	AED	GBP	JPY	0.019	0.076	0.911	1.006	0.608
	AED	GBP	CHF	0.287	0.409*	7.231	1.402	28.670
	AED	JPY	CHF	0.126	0.288*	4.477	1.136	11.987
	AED	JPY	GBP	0.006	0.078	0.897	1.006	0.607
3) MLE								
	AED	CHF	JPY	0.145	0.472*	4.741	1.136	11.959
	AED	CHF	GBP	0.304	0.682*	7.564	1.402	28.673
	AED	GBP	JPY	0.018	0.075	0.902	1.006	0.607
	AED	GBP	CHF	0.288	0.410*	7.295	1.402	28.672
	AED	JPY	CHF	0.125	0.285*	4.457	1.136	11.999
	AED	JPY	GBP	0.006	0.079	0.908	1.006	0.608
4) IV								
	AED	CHF	JPY	0.150	0.516*	1.286	1.132	11.664
	AED	CHF	GBP	0.267	0.765*	2.812	1.396	28.348
	AED	GBP	JPY	0.001	0.024	0.130	1.003	0.323
	AED	GBP	CHF	0.279	0.410*	1.994	1.402	28.673
	AED	JPY	CHF	0.137	0.398*	1.135	1.105	9.513
	AED	JPY	GBP	0.004	0.169	0.685	1.001	[0.169]
5) Quadratic								
	AED	CHF	JPY	0.130	0.448*	4.390	1.137	12.017
	AED	CHF	GBP	0.318	0.739*	7.881	1.399	28.537
	AED	GBP	JPY	0.024	0.069	0.818	1.006	0.601
	AED	GBP	CHF	0.322	0.440*	7.888	1.400	28.577
	AED	JPY	CHF	0.163	0.245*	3.902	1.135	11.898
	AED	JPY	GBP	0.052	0.125	1.441	1.004	0.401
6) Linear ECM								
	AED	CHF	JPY	0.168	0.502*	4.872	1.134	11.782
	AED	CHF	GBP	0.325	0.735*	7.823	1.400	28.557
	AED	GBP	JPY	0.041	0.082	0.982	1.006	0.604
	AED	GBP	CHF	0.348	0.430*	7.815	1.401	28.639
	AED	JPY	CHF	0.178	0.295*	4.689	1.136	11.946

	AED	JPY	GBP	0.006	0.082	0.918	1.006	0.607
7) Nonlinear ECM								
	AED	CHF	JPY	0.174	0.500*	4.799	1.134	11.796
	AED	CHF	GBP	0.335	0.730*	7.752	1.400	28.583
	AED	GBP	JPY	0.044	0.090	1.055	1.006	0.590
	AED	GBP	CHF	0.392	0.447*	8.276	1.399	28.513
	AED	JPY	CHF	0.196	0.295*	4.716	1.136	11.941
	AED	JPY	GBP	0.014	0.080	0.887	1.006	0.608
8) ARDL(1,1)								
	AED	CHF	JPY	0.142	0.449*	4.280	1.137	12.016
	AED	CHF	GBP	0.313	0.749*	7.832	1.398	28.475
	AED	GBP	JPY	0.026	0.087	1.001	1.006	0.598
	AED	GBP	CHF	0.357	0.426*	7.832	1.402	28.658
	AED	JPY	CHF	0.157	0.273*	4.280	1.137	12.021
	AED	JPY	GBP	0.031	0.088	1.001	1.006	0.601
9) ARDL(1,1) long-run								
	AED	CHF	JPY	0.142	0.611*	4.362	1.114	10.204
	AED	CHF	GBP	0.313	0.463*	3.402	1.343	25.555
	AED	GBP	JPY	0.026	0.097	0.547	1.006	0.564
	AED	GBP	CHF	0.357	0.660*	5.015	1.230	18.725
	AED	JPY	CHF	0.157	0.336*	2.876	1.129	11.389
	AED	JPY	GBP	0.031	-0.079	-0.517	1.018	1.779

* Significant at the 5% level, [ ] inverted.

Table 11. Cross-currency hedging—QAR

	x	*y*	*z*	R^2	*h*	*t statistic*	VR	VD (%)
1) OLS								
	QAR	CHF	JPY	0.129	0.495*	3.568	1.148	12.895
	QAR	CHF	GBP	0.232	0.622*	5.102	1.303	23.241
	QAR	GBP	JPY	0.001	0.035	0.301	1.001	0.105
	QAR	GBP	CHF	0.232	0.373*	5.102	1.303	23.241
	QAR	JPY	CHF	0.119	0.071*	3.412	1.135	11.925
	QAR	JPY	GBP	0.001	0.030	0.301	1.001	0.105
2) Cochrance-Orcutt								
	QAR	CHF	JPY	0.163	0.521*	3.813	1.148	12.860
	QAR	CHF	GBP	0.264	0.611*	5.288	1.303	23.233
	QAR	GBP	JPY	0.033	0.079	0.698	1.000	[0.059]
	QAR	GBP	CHF	0.243	0.353*	4.913	1.302	23.174
	QAR	JPY	CHF	0.135	0.271*	3.652	1.148	12.876
	QAR	JPY	GBP	0.001	0.029	0.285	1.001	0.105
3) MLE								
	QAR	CHF	JPY	0.164	0.515*	3.832	1.148	12.874
	QAR	CHF	GBP	0.264	0.601*	5.315	1.302	23.214
	QAR	GBP	JPY	0.026	0.066	0.584	1.000	0.021
	QAR	GBP	CHF	0.239	0.358*	4.960	1.302	23.203
	QAR	JPY	CHF	0.134	0.270*	3.648	1.148	12.880
	QAR	JPY	GBP	0.001	0.027	0.268	1.001	0.104
4) IV								
	QAR	CHF	JPY	0.123	0.439*	0.809	1.146	12.734
	QAR	CHF	GBP	0.205	0.700*	2.417	1.297	22.876
	QAR	GBP	JPY	0.001	0.027	0.148	1.001	0.101
	QAR	GBP	CHF	0.230	0.362*	1.463	1.302	23.218
	QAR	JPY	CHF	0.111	0.284*	1.002	1.147	12.788
	QAR	JPY	GBP	0.001	0.024	0.148	1.001	0.100

5) Quadratic								
	QAR	CHF	JPY	0.142	0.496*	3.579	1.148	12.895
	QAR	CHF	GBP	0.252	0.682*	5.355	1.299	23.030
	QAR	GBP	JPY	0.047	0.034	0.298	1.001	0.105
	QAR	GBP	CHF	0.294	0.392*	5.521	1.302	23.186
	QAR	JPY	CHF	0.190	0.244*	3.425	1.147	12.841
	QAR	JPY	GBP	0.053	0.100	0.957	1.004	[0.436]
6) Linear ECM								
	QAR	CHF	JPY	0.221	0.554*	4.070	1.146	12.714
	QAR	CHF	GBP	0.289	0.669*	5.338	1.301	23.109
	QAR	GBP	JPY	0.093	0.046	0.402	1.001	0.095
	QAR	GBP	CHF	0.317	0.386*	5.360	1.302	23.213
	QAR	JPY	CHF	0.180	0.297*	3.996	1.145	12.638
	QAR	JPY	GBP	0.019	0.046	0.432	1.001	0.078
7) Nonlinear ECM								
	QAR	CHF	JPY	0.285	0.565*	4.272	1.145	12.638
	QAR	CHF	GBP	0.335	0.641*	5.192	1.302	23.219
	QAR	GBP	JPY	0.107	0.049	0.431	1.001	0.087
	QAR	GBP	CHF	0.328	0.390*	5.359	1.302	23.194
	QAR	JPY	CHF	0.211	0.326*	4.306	1.137	12.075
	QAR	JPY	GBP	0.024	0.056	0.517	1.000	0.028
8) ARDL(1,1)								
	QAR	CHF	JPY	0.174	0.515*	3.616	1.148	12.874
	QAR	CHF	GBP	0.285	0.698*	5.574	1.297	22.900
	QAR	GBP	JPY	0.060	0.078	0.671	1.000	[0.061]
	QAR	GBP	CHF	0.321	0.397*	5.574	1.301	23.145
	QAR	JPY	CHF	0.173	0.270*	3.616	1.148	12.879
	QAR	JPY	GBP	0.029	0.071	0.671	1.000	[0.078]
9) ARDL(1,1) long-run								
	QAR	CHF	JPY	0.174	0.608*	3.314	1.139	12.217
	QAR	CHF	GBP	0.285	0.374*	2.426	1.243	19.553
	QAR	GBP	JPY	0.060	-0.109	-0.404	1.017	1.670
	QAR	GBP	CHF	0.321	0.727*	3.568	1.024	2.380
	QAR	JPY	CHF	0.173	0.302*	1.951	1.144	12.569
	QAR	JPY	GBP	0.029	-0.195	-1.145	1.057	5.369

* Significant at the 5% level, [ ] inverted.

Table 12. Cross-currency hedging—BHD

	x	*y*	*z*	R^2	*h*	*t statistic*	VR	VD (%)
1) OLS								
	BHD	CHF	JPY	0.053	0.436*	1.777	1.110	5.252
	BHD	CHF	GBP	0.160	0.530*	3.291	1.190	15.970
	BHD	GBP	JPY	0.039	-0.120	-1.515	1.010	3.874
	BHD	GBP	CHF	0.160	0.300*	3.291	1.190	15.970
	BHD	JPY	CHF	0.053	0.135*	1.777	1.055	5.252
	BHD	JPY	GBP	0.039	-0.154	-1.515	1.040	3.874
2) Cochrance-Orcutt								
	BHD	CHF	JPY	0.084	0.362*	1.716	1.055	5.229
	BHD	CHF	GBP	0.216	0.527*	3.587	1.190	15.968
	BHD	GBP	JPY	0.073	-0.215	-1.262	1.039	3.799
	BHD	GBP	CHF	0.182	0.270*	3.052	1.188	15.801
	BHD	JPY	CHF	0.072	0.116*	1.598	1.054	5.147
	BHD	JPY	GBP	0.058	-0.136	-1.314	1.040	3.820
3) MLE								
	BHD	CHF	JPY	0.093	0.378*	1.854	1.055	5.249

	BHD	CHF	GBP	0.221	0.517*	3.724	1.190	15.958
	BHD	GBP	JPY	0.067	-0.225	-1.353	1.040	3.834
	BHD	GBP	CHF	0.174	0.276*	3.096	1.188	15.859
	BHD	JPY	CHF	0.074	0.128*	1.730	1.055	5.235
	BHD	JPY	GBP	0.056	-0.143	-1.372	1.040	3.853
4) IV								
	BHD	CHF	JPY	0.048	0.399*	0.939	1.055	5.247
	BHD	CHF	GBP	0.150	0.687*	2.026	1.171	14.591
	BHD	GBP	JPY	0.035	-0.290	-0.705	1.039	3.776
	BHD	GBP	CHF	0.158	0.348*	1.555	1.184	15.572
	BHD	JPY	CHF	0.044	0.177*	1.004	1.050	4.751
	BHD	JPY	GBP	0.048	-0.168	-0.989	1.040	3.846
5) Quadratic								
	BHD	CHF	JPY	0.071	0.245*	0.955	1.048	4.542
	BHD	CHF	GBP	0.171	0.588*	3.370	1.187	15.782
	BHD	GBP	JPY	0.117	-0.029	-0.155	1.009	0.852
	BHD	GBP	CHF	0.231	0.316*	3.570	1.189	15.930
	BHD	JPY	CHF	0.104	0.126*	1.672	1.055	5.223
	BHD	JPY	GBP	0.092	-0.080	-0.743	1.031	2.979
6) Linear ECM								
	BHD	CHF	JPY	0.170	0.473*	2.160	1.045	4.289
	BHD	CHF	GBP	0.256	0.590*	3.600	1.187	15.771
	BHD	GBP	JPY	0.127	-0.234	-1.384	1.040	3.858
	BHD	GBP	CHF	0.286	0.329*	3.660	1.188	15.832
	BHD	JPY	CHF	0.134	0.171*	2.205	1.052	4.900
	BHD	JPY	GBP	0.080	-0.148	-1.401	1.040	3.867
7) Nonlinear ECM								
	BHD	CHF	JPY	0.216	0.515*	2.354	1.049	4.682
	BHD	CHF	GBP	0.329	0.537*	3.348	1.190	15.968
	BHD	GBP	JPY	0.224	-0.221	-1.330	1.040	3.820
	BHD	GBP	CHF	0.303	0.321*	3.534	1.189	15.897
	BHD	JPY	CHF	0.170	0.197*	2.486	1.044	4.188
	BHD	JPY	GBP	0.081	-0.140	-1.235	1.040	3.841
8) ARDL(1,1)								
	BHD	CHF	JPY	0.119	0.446*	2.005	1.054	5.132
	BHD	CHF	GBP	0.207	0.609*	3.563	1.185	15.624
	BHD	GBP	JPY	0.102	-0.186	-1.081	1.038	3.621
	BHD	GBP	CHF	0.267	0.322*	3.563	1.189	15.889
	BHD	JPY	CHF	0.066	0.161*	2.005	1.053	5.068
	BHD	JPY	GBP	0.044	-0.118	-1.081	1.038	3.657
9) ARDL(1,1) long-run								
	BHD	CHF	JPY	0.119	0.460*	1.938	1.053	5.069
	BHD	CHF	GBP	0.207	0.308*	1.627	1.152	13.158
	BHD	GBP	JPY	0.102	-0.452	-1.377	1.014	1.373
	BHD	GBP	CHF	0.267	0.690*	2.382	1.107	9.655
	BHD	JPY	CHF	0.066	0.375*	1.763	1.111	10.006
	BHD	JPY	GBP	0.044	-0.332	-1.628	1.012	1.175

* Significant at the 5% level.

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The Determinants of Corporate Liquidity in Real Estate Industry: Evidence from Vietnam

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Abstract

This paper investigates the impact of firm size, profitability, cash flows, investment opportunities, leverage and capital expenditure on cash holding level and cash conversion cycle for 54 listed real estate companies in Vietnam stock exchange during 2010-2014. The empirical result highlights two most important variables that affect the cash holdings–profitability and capital expenditure that have strong influence on the corporate liquidity of these real estate companies. The study also indicates that policies on cash holdings and working capital investment have been affected under financially constrained conditions. The study result provides speculative motive of cash holdings as well as the emphasis of financial constraints on the adjustment of working capital investment in the real estate industry.

Keywords: corporate liquidity, cash holding, cash conversion cycle, real estate industry, Vietnam

1. Introduction

Real estate market is closely linked to the capital market that effects to the health of the economy. The real estate market can not reach a strong and sustainable development without the stable capital market. The proportion of Vietnam real estate, which varies in different countries, accounts for 40% of the whole national assets, and nearly 30% of total economic activities. In the real estate industry, profitability and liquidity are important indicators in financial decisions. While the financial decisions mainly focus on traditional solvency ratios and the capital structure of companies, the corporate liquidity is related to decisions on working capital management. How to establish a target working capital to improve operating performance and maximize firm value is still a big question that is much attractive to many researchers and practitioners in the literature.

Cash holding levels and the cash conversion cycle are closely related to each other that will enhance the firm value. Anjum and Malik (2013) used cash holdings to investigate the determinants of corporate liquidity. Cash conversion cycle is referred to as liquidity measures (Maness & Zietlow, 2004) and used in previous studies (Valipour, Moradi, & Farsi, 2012), (Attari & Raza, 2012), (Owolabi & Obida, 2012). Thus, this study uses cash holding level and cash conversion cycle as representatives of corporate liquidity. Although the corporate liquidity have been studies in cross nation scope in different circumstances, there is no study on cash holdings and cash conversion cycle as the corporate liquidity in Vietnam. For the purpose of the study, this paper investigates determinants of corporate liquidity and its impact in real estate companies listed on Vietnam stock exchange during 2010-2014.

2. Literature Review

2.1 Cash Holding Level

Cash is usually defined as cash-in-hand and short-term marketable securities or cash equivalents (Opler, Pinkowitz, Stulz, & Williamson, 1999; Ferreira & Vilela, 2004; Bates, Kahle, & Stulz, 2009). The cash holding level is measured by the cash over total assets. These are common determinants used in previous study and their relationship with cash holding level.

2.1.1 Firm Size

According to Opler et al. (1999), firms that have the greatest access to the capital markets, such as large frms and those with high credit ratings, tend to hold lower ratios of cash to total non-cash assets. Ferreira and Vilela (2004) concluded that the size and the level of cash holding is negatively correlated because it is more expensive for small firms to raise funds in the borrowing markets; larger firms are more likely have diversified business portfolio, so they are less vulnerable to financial distress. Meanwhile, Pinkowitz and Williamson (2001) have contrasting results in their studies.

H1: There is a negative relationship between firm size and cash holdings.

2.1.2 Profitability

Dobetz and Grüninger (2006) proposed cash and profits are substitute, thus they have a negative relationship to each other. Nguyen (2006) investigated a study on a sample of 9,168 firm-year observations from Tokyo Stock Exchange for the period of 1992 to 2003. Regression analysis recognized a positive relationship between profitability and cash holdings.

H2: There is a positive relationship between profitability and cash holdings.

2.1.3 Cash Flow

According to Kim, Mauer, and Sherman (1998), cash flow can be seen as cash substitutes. Thus it is expected that there is a negative relation between cash flow and cash holdings. Opler et al. (1999) argued that firms with riskier cash flows hold relatively high ratios of cash to total non-cash assets. Pinkowitz and Williamson (2001) has found evidence of a positive influence of cash flow on cash holdings.

H3: There is a positive relationship between cash flows and cash holdings.

2.1.4 Investment Opportunity

According to Ferreira and Vilela (2004), when a firm has greater investment opportunity, the firm will have greater bankruptcy cost, the firm will hold more cash in order to avoid financial distress. Kim et al. (1998) found evidence of a positive relationship between investment opportunity and cash holdings. J. Kim, H. Kim, and Woods (2011) also found evidence to support this direct relationship. They argued that firms with higher investment opportunities tend to hold more cash because cash holdings reduce the likelihood of financial distress and act as a safety reserve to cope with unexpected losses due to cash shortages or external fund-raising constraints.

H4: There is a positive relationship between investment opportunity and cash holdings.

2.1.5 Leverage

Hardin, Highfield, Hill, and Kelly (2009) argued that leverage impose a negative effect on cash holdings as leverage can be used as a mechanism to minimize agency costs in free cash flow problem. In contrast to this argument, A. Ozkan and N. Ozkan (2004) in their sample of all UK firms over the period 1984-1999 found that higher cash holdings are associated lower level of leverage in firms' capital structure. As explained by Ferreira and Vilela (2004), leverage increases the probability of bankruptcy, thus firms with higher leverage are expected to hold more cash to reduce the probability of experiencing financial distress.

H5: There is a negative relationship between leverage and cash holdings.

2.1.6 Capital Expenditure

According to Bates et al. (2009), the inverse relation between cash holding demand and borrowing capacity leads to an inverse relation between capital expenditure and cash holdings. However, Opler et al. (1999) found that cash holdings increased significantly as capital expenditures increased.

H6: There is a negative relationship between capital expenditure and cash holdings.

Table 1. Previous studies on cash holding level

Variables	Authors approving positive relationship (+)	Authors approving negative relationship (-)	Hypotheses development
Firm size	Pinkowitz and Williamson (2001)	Faulkender (2002), Bover and Watson (2005), Ferreira and Vilela (2004)	H1-Negative
Profitability	Nguyen (2006)	Dobetz and Grüninger (2006)	H2-Positive
Cash flow	Opler et al. (1999), Pinkowitz and Williamson (2001)	Kim et al (1998), Ferreira and Vilela (2004)	H3-Positive
Investment opportunity	Ferreira and Vilela (2004), J. Kim et al. (2011)		H4-Positive
Leverage	Ferreira and Vilela (2004)	Hardin et al. (2009),	H5-Negative
Capital expenditure	Opler et al. (1999)	Bates et al. (2009)	H6-Negative

2.2 Cash Conversion Cycle

Cash conversion cycle (CCC) is defined as the length of time from the payment for the purchase of raw materials to manufacture a product until the collection of account receivables associated with the sale of the product (Besley & Brigham, 2005). The CCC is calculated by taking into account three components: days inventory outstanding (DIO), days sales outstanding (DSO), days payables outstanding (DPO).

2.2.1 Firm Size

Firm size also has its influence on the management of working capital. Large companies have more bargaining power with suppliers and customers compared to small companies. (Berger, Klapper, & Udell, 2001) and (Jordan, Lowe, & Taylor, 1998) argued that the cost of investment in working capital would be lower for larger firms compared to smaller one since larger corporations have lower information asymmetry and thus lower cost of external financing. Moreover, larger firms have better access to capital markets and have larger capacity to extend more trade credits that enable them to have more investment in working capital as compared to smaller firms (Petersen & Rajan, 1997).

H1: There is a positive relationship between firm size and cash conversion cycle.

2.2.2 Profitability

Working capital and profitability have interrelationships. On the one hand, more profitability makes firms stronger to negotiate with both suppliers and customers, and firms can use these competitive advantages to improve their liquidity (Petersen & Rajan, 1997). On the other hand, working capital has important effects on profitability. More investment in working capital means more sources engaged and make more opportunity cost for firms (Deloof, 2003).

H2: There is a negative relationship between profitability and cash conversion cycle

2.2.3 Cash Flow

Pecking order theory (Myers & Majluf, 1984) demonstrates that firms prioritize their sources of financing from internal financing to equity since internal sources are cheaper than other finance alternatives. As a result, working capital management would be sensitive to the cash flow and firms with more cash flow would afford to have more investment in working capital requirement. Fazzari and Petersen (1993) argued that firms with larger cash flow have more working capital because these firms have more internal sources to financing working capital and enable to have higher current asset levels.

H3: There is a positive relationship between cash flow and cash conversion cycle.

2.2.4 Investment Opportunity

Up to now, there is no study providing evidence of the existence of a correlation between investment opportunity and cash conversion cycle. When firms are able to make more profit in the future, they have a tendency to increase their investment in working capital as speculative motive. Therefore, a positive relationship between investment opportunities and cash conversion cycle is hypothesized.

H4: There is a positive relationship between investment opportunity and cash conversion cycle.

2.2.5 Leverage

Leverage shows the ratio of total debt to total assets. When this ratio is high, it indicates that internal investment is low and firms need to finance their operations. Baños‐Caballero, García‐Teruel, and Martínez‐Solano (2010) indicated that there is a negative relationship between debt and cash conversion cycle. In other words, a firm with low needs of working capital needs to finance from debt.

H5: There is a negative relationship between leverage and cash conversion cycle.

2.2.6 Capital Expenditure

The level of investment in fixed assets would affect the efficiency of working capital management. Fazzari and Petersen (1993) believed that the level of working capital might compete with the fixed investment for the available source of finance. Therefore, firms may try to reduce the amount of working capital investments to handle their financial constraints.

H6: There is a negative relationship between capital expenditure and cash conversion cycle

All of the measurements of firm size, leverage, investment opportunity, cash flows, profitability and capital expenditure in the relation with cash conversion cycle are the same as those in the relation with cash holding level.

Table 2. Previous studies on cash conversion cycle

Variables	Authors approving positive relationship (+)	Authors approving negative relationship (-)	Hypotheses development
Firm size	Berger et al. (2001), Jordan et al. (1998), Petersen & Rajan (1997)	Petersen & Rajan (1997)	H1-Positive
Profitability		Petersen & Rajan (1997) Deloof (2003)	H2-Negative
Cash flow	Fazzari & Petersen (1993) Myers & Majluf (1984)		H3-Positive
Investment opportunity	(*)		H4-Positive
Leverage		Baños - Caballero et al. (2010)	H5-Negative
Capital expenditure		Fazzari & Petersen (1993)	H6-Negative

Note. (*) There is no study providing evidence of the existence of a correlation between investment opportunities and cash conversion cycle.

3. Data and Methodology

3.1 Data

The data used in this study is derived from the annual report of real estate companies listed on Ho Chi Minh Stock Exchange and Hanoi Stock Exchange. The total number of real estate companies is 54. The annual reports are obtained from 31st, December 2010 to 31st, December 2014. There are 270 observations for the whole sample.

Table 3. The summary of variables in the study

Variables	CR	CCC	TA	ROA	CF	PB	LEV	CE
Mean	0.0591	4258.8250	3839.4780	0.0309	0.0321	0.7124	0.5441	0.0315
Median	0.0214	960.6599	1451.1160	0.0218	0.0250	0.6313	0.5494	0.0043
Maximum	0.8149	175726.9	90485.31	0.2701	0.2597	3.5077	0.9154	0.4682
Minimum	0.0004	30.7495	111.7027	-0.2123	-0.1532	0.0000	0.1137	0.0000
Std. Dev.	0.1027	16571.1300	9161.8680	0.0554	0.0499	0.5782	0.1577	0.0641
Skewness	4.3228	8.5092	6.2652	0.3882	0.9190	1.9610	-0.1926	3.7268
Kurtosis	27.2418	79.3434	49.8729	7.3260	6.6516	8.8563	2.5384	20.2653
Observations	270	270	270	270	270	270	270	270

The mean cash ratio of the real estate companies is 5.9% with a standard deviation of 10.27%, which indicates a right-skewed distribution of cash ratio. Similarly, the cash conversion cycle has the mean value of 4259 days with standard deviation of 9162 days, which denotes a clear right-skewed distribution. Thus, cash ratio (CR) and cash conversion cycle (CCC) are taken under the nature logarithm form. The average total asset of this sample is 3839 billion VND with a standard deviation of 9162 billion VND, indicating wide variance across firms. Average return on asset (ROA) is 3.09%, which belongs to the bottom group in terms of ability to generate profit as reported by Vietstock. Average cash flow from operations (CF) is only 0.032, implying that this industry has a low capacity to generate cash inflows. The average of market-to-book-value ratio (PB), at 0.7124, reveals that our current capital markets is undervaluing with the sampled real estate companies. The mean value of leverage (LEV) is 54.41%, which reinforces the fact that real estate companies rely more heavily on debt than on equity for financing. The mean value of capital expenditure (CE) only accounts for 3.15% of total assets, which is a low proportion in comparison to the cash ratio.

3.2 Methodology

This study follows previous studies to define the formulas associated with each variable. According to J. Kim et al. (2011), the cash holding level is measured by the cash over total assets. (Charitou, Elfani, & Lois, 2010) and (Valipour et al., 2012) used the cash conversion cycle in their studies as a comprehensive indicator of liquidity. To reduce the asset variance among companies, this study measures firm size as the natural logarithm of total assets, as suggested by J. Kim et al. (2011). (Dobetz & Grüninger, 2006) and Valipour et al. (2012) used return on assets to measure profitability (ROA). As suggested by (Opler et al., 1999), (A. Ozkan & N. Ozkan, 2004), (Ferreira & Vilela, 2004), cash flow is measured by the ratio of earnings after interests, dividends, taxes but before depreciation and amortization to total assets (CF). This study will follow J. Kim et al. (2011) to measure investment opportunity as the market-to-book-value ratio. According to many empirical findings, leverage is measured as the ratio of total liabilities to total assets (LEV). Based upon previous studies, capital expenditure (CE) is measured as the ratio of capital expenditure to total assets. Table 4 summarizes how to measure all kinds of variables used in this study

Table 4. The measurement of variables in the study

Dependent variables		
Corporate Liquidity	Cash ratio $CR = \frac{\text{Cash and cash equivalens}}{\text{Total assets}}$	Cash conversion cycle CCC = DIO+DSO-DPO
Independent variables		
Firm size	Take the natural logarithm of total assets LNTA	
Leverage	$LEV = \frac{\text{total liabilities}}{\text{total assets}}$	
Investment opportunity	$PB = \frac{\text{market value}}{\text{book value}}$	
Cash flow	$CF = \frac{\text{Earnings after interests,dividends,taxes but before depreciation and amortization}}{\text{Total assets}}$	
Profitability	$ROA = \frac{\text{Net income}}{\text{Total assets}}$	
Capital expenditure	$CE = \frac{\text{Capital expenditure}}{\text{Total assets}}$	

This study combines the descriptive statistics derived from the data and the facts in the real estate market to reinforce of clear perspective of this market. Then, the Pearson correlation matrix is used to check the correlation between variables. The weighted least-squares (WLS) or ordinary least-squares (OLS) is used to examine the impact of firm size, leverage, investment opportunity, cash flows, profitability, capital expenditure in explaining the determinants of corporate liquidity in real estate industry. The reason for using WLS is because this study involves a cross sectional time series data, which may result in the problem of heteroskedasticity and violates the constant residual assumptions of OLS.

Real estate companies are also separated into financially constrained firms and unconstrained firms based on the criteria suggested by Custodio, Ferreira, and Raposo (2004). Financially constrained firms are those with total assets over 5-year period smaller than the first quartile point. Financially unconstrained firms are those with total assets over 5-years period larger than the third quartile point. The rationale behind this is to test the extent of each variable on firms of different financial conditions besides testing the effects of variables on the whole sample. After obtaining regression models, this study uses the VIF test to detect multicollinearity and White-test to detect heteroskedasticity.

All the six models in this study are built in the form of multivariate linear model as follows:

Model 1 (Cash holding level-Whole sample)

$$LNCR_{i,t} = \beta_0 + \beta_1 LNTA_{i,t} + \beta_2 ROA_{i,t} + \beta_3 CF_{i,t} + \beta_4 PB_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CE_{i,t} + \varepsilon_{i,t} \quad (1)$$

Model 2 (Cash holding level – Financially constrained firms)

$$LNCR_{i,t} = \beta_0 + \beta_1 LNTA_{i,t} + \beta_2 ROA_{i,t} + \beta_3 CF_{i,t} + \beta_4 PB_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CE_{i,t} + \varepsilon_{i,t} \quad (2)$$

Model 3 (Cash holding level – Financially unconstrained firms)

$$LNCR_{i,t} = \beta_0 + \beta_1 LNTA_{i,t} + \beta_2 ROA_{i,t} + \beta_3 CF_{i,t} + \beta_4 PB_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CE_{i,t} + \varepsilon_{i,t} \quad (3)$$

Model 4 (Cash conversion cycle – Whole sample)

$$LNCCC_{i,t} = \beta_0 + \beta_1 LNTA_{i,t} + \beta_2 ROA_{i,t} + \beta_3 CF_{i,t} + \beta_4 PB_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CE_{i,t} + \varepsilon_{i,t} \quad (4)$$

Model 5 (Cash conversion cycle – Financially constrained firms)

$$LNCCC_{i,t} = \beta_0 + \beta_1 LNTA_{i,t} + \beta_2 ROA_{i,t} + \beta_3 CF_{i,t} + \beta_4 PB_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CE_{i,t} + \varepsilon_{i,t} \quad (5)$$

Model 6 (Cash conversion cycle – Financially unconstrained firms)

$$LNCCC_{i,t} = \beta_0 + \beta_1 LNTA_{i,t} + \beta_2 ROA_{i,t} + \beta_3 CF_{i,t} + \beta_4 PB_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CE_{i,t} + \varepsilon_{i,t} \quad (6)$$

4. Results and Discussion

4.1 Empirical Results

Table 5 shows that cash ratio is positively and significantly correlated with firms size, investment opportunity, cash flows, profitability and capital expenditure. Leverage is the only variable that has significantly negative association with cash ratio.

Table 5. Pearson correlation coefficient matrix - cash holding level

Variables	LNCR	LNTA	LEV	PB	CF	ROA	CE
LNCR	1.0000						
LNTA	0.0607	1.0000					
LEV	-0.0590	0.1853	1.0000				
PB	0.2130	0.3368	0.1487	1.0000			
CF	0.3047	-0.1168	0.0094	0.1489	1.0000		
ROA	0.4763	-0.0213	-0.1126	0.2275	0.7302	1.0000	
CE	0.1778	0.0666	0.0008	0.2029	0.1101	0.1732	1.0000

Table 6 shows that cash conversion cycle is positively and significantly correlated with firm size and leverage, and is negatively correlated with investment opportunity, cash flow, profitability and capital expenditure.

Table 6. Pearson correlation coefficient matrix - cash conversion cycle

Variables	LNCCC	LNTA	LEV	PB	CF	ROA	CE
LNCCC	1.0000						
LNTA	0.2705	1.0000					
LEV	0.1377	0.1853	1.0000				
PB	-0.1206	0.3368	0.1487	1.0000			
CF	-0.4043	-0.1168	0.0094	0.1489	1.0000		
ROA	-0.4008	-0.0213	-0.1126	0.2275	0.7302	1.0000	
CE	-0.2678	0.0666	0.0008	0.2029	0.1101	0.1732	1.0000

Table 7 and Table 8 summarize regression results for identifying the factors that affect cash holding level and cash conversion cycle in the whole sample and two groups of financially constrained and unconstrained firms. The White test and the VIF are also presented at the end of each model for reference.

Table 7. Regression models of cash holding level

Variables	Cash Ratio (LNCR)		
	Model 1	Model 2	Model 3
	Whole sample	Financially constrained sample	Financially unconstrained sample
LNTA	0.0194	0.3936	0.4380**
ROA	12.2334**	18.0456**	21.7544**
CF	-1.3166	-10.2881	-9.2444
PB	-0.3781**	-0.2473	-0.2312
LEV	1.1391**	1.4683	0.0429
CE	4.3721**	5.8052**	1.3365
Constant	-5.2524	-15.2390	-17.1867
Observations	270	70	70
Adjusted R-squared	0.3581	0.1559	0.3864
White-test (p-value)	0.00013	0.1041**	0.5493**
Mean VIF	1.56	1.72	3.39

Note. *: Coefficient is significant at 0.04 level; **: Coefficient is significant at 0.05 level.

The empirical study on cash holding level with the whole sample data indicates that ROA, PB, LEV, CE are statistically significant at the 0.05 level as in Table 7.

The positive coefficient of ROA supports the transaction motive of cash holdings. This motive implies that profitable firms intentionally hold more cash to smooth daily transactions. This finding is consistent with the study of determinants of cash holdings in Tokyo Stock Exchange by Nguyen (2006).

Investment opportunity has a negative impact on the level of cash holdings. Although this result contrasts to previous studies that needs to take a look at the reality of real estate industry in Vietnam. For the last few years, after the notorious “real estate bubble” phenomenon which has a destructive impact on the development of this industry, many leading companies in this field have been frozen in their trading activities. To respond to many investment opportunities, real estate companies choose to invest in inventory instead of cash.

Leverage exerts a positive impact on cash holding level of firms. This result is consistent with studies of Ferreira and Vilela (2004). High leveraged firms might be expected to hold more cash because of their higher bankruptcy risks. As mentioned earlier, the proportion of debt to total assets accounts for more than 50% across real estate companies. Recently, tighten capital flows from banks have discouraged real estate firm holding more cash to deal with periodical debt repayment, which supports the transaction motive.

Capital expenditure imposes a positive impact on cash holding level. For the recovering real estate industry, the increase of capital expenditure goes with the increase of cash holdings because firms may use up their borrowing capacity secured by capital expenditures in exchange for cash available to deal with unexpected events. This reasoning is consistent with the discussion made before regarding the current circumstance of Vietnam real estate industry. The unpredictability of this industry leads to such prudent financial decisions.

The empirical study on cash conversion cycle with the whole sample data indicates that LNTA, ROA, CF, PB, CE are statistically significant at the 0.05 level as in Table 8.

The positive coefficient of LNTA indicates that cash conversion cycle is positively affected by firm size. The negative coefficients of ROA, CF, PB, CE indicates that profitability, cash flow, investment opportunity and capital expenditure impose an indirect impact on cash conversion cycle. Most of these relationships are consistent with previous studies but for the cash flow variable.

The positive coefficient of LNTA is consistent with Berger et al. (2001) and Jordan et al. (1998). The cost of investment in working capital would be lower for larger firms compared to smaller one since larger corporations have lower information asymmetry and thus lower cost of external financing. Moreover, larger firms have better access to capital markets and have larger capacity to extend more trade credits that enable them to have more investment in working capital as compared to smaller firms. All above reasons motivate larger firms to invest more in working capital, thus increasing the cash conversion cycle.

The negative relationship between profitability and cash conversion cycle can be explained by the argument that more profitability makes firms stronger to negotiate with both suppliers and customers, and firms can use these competitive advantages to improve their liquidity (Petersen & Rajan, 1997). Although the negative coefficients of CF and PB in this model are statistically significant, it is not appropriate for the practical condition of Vietnam real estate companies.

Table 8. Regression models of cash conversion cycle

Variables	Cash Conversion Cycle (LNCCC)		
	Model 4	Model 5	Model 6
	Whole sample	Financially constrained firms	Financially unconstrained firms
LNTA	0.3168**	1.1401**	-0.0939
ROA	-4.5253**	-34.5869**	-19.0611**
CF	-6.0670**	1.8343	-2.6625
PB	-0.2908**	2.0722**	0.2842
LEV	0.7963	0.8736	-0.6933
CE	-4.8070**	-22.3171	-4.3736**
Constant	-1.6603	-23.3442	11.4285
Observations	270	70	70
Adjusted R-squared	0.2943	0.5918	0.3819
White-test (p-value)	0.0468*	0.00004	0.256**
Mean VIF	1.53	2.38	1.79

Note. *: Coefficient is significant at 0.04 level; **: Coefficient is significant at 0.05 level.

4.2 Discussion

4.2.1 Cash Holding Level

Profitability is the most consistent variable to explain the changes of cash holding level regardless of their types of real estate companies. Whether a company is under financial constraint or not, they tend to hoard more cash when they can generate more profit. This is definitely not a surprise under real circumstances of Vietnam economy where many unanticipated crisis have destroyed a potential real estate industry. That is the reason why this industry deal with its liquidity more prudently, in which the highly profitable companies intentionally hold more cash. There are two reasons for this. Firstly, cash is not cost-free sources so that unprofitable firms hold unless they have a clear motive to make use of this source to enhance value for their companies. Secondly, cash is increasingly essential in firms with high demand of cash to ensure the transaction motive to be responded. In fact, the profitable firms need more cash to smooth the daily goods purchasing and selling activities.

4.2.2 Cash Conversion Cycle

Profitability and capital expenditure are the most consistent variables to explain the changes of cash conversion cycle in real estate industry. The highly profitable firms will take advantage of its stable condition to negotiate with contractors and material suppliers. Lengthening the payment term is more feasible than expediting the collection period. This can be explained by the fact that this industry has experienced a freezing stage when the supply too far exceeds the demand. Therefore, once trading transaction occurs, the sellers have to use attractive payment term – meaning longer collection period to encourage final customers' purchasing decisions. For lowly profitable firms, they are forced to invest much more in the operating cycle. They not only stock a large amount of inventory, bear a long collection period but also impossibly lengthen the payment term as highly profitably firms.

The negative relationship of capital expenditure with cash conversion cycle over three sets of data indicates that there exists the competence between capital expenditure and working capital in this industry. This reveals a practical condition not only in real estate industry but also in other industries. The finance sources to firms are limited no matter how good their businesses are. Firms frequently have to face with a lot of constraints to make a decision on what should be given heavy investment, what should be overlooked so that this decision can bring the most value to its shareholders and firm's future prospect.

5. Conclusion

This study highlights two most important variables that affect corporate liquidity – profitability and capital expenditure. Both cash holding level and cash conversion cycle have a statistically significant relationship with profitability and capital expenditure. While profitability is positively correlated with cash holding level, it is negatively correlated with cash conversion cycle. This trend comes from the condition of real estate industry, in which profitable firms have a tendency to invest more in cash to grasp opportunity in the future as speculative motive and deal with unexpected events as precautionary motive, but they invest less in working capital because they are capable of negotiating with partners for longer payment terms and shorter collection period.

Capital expenditure has a positive relationship with cash holding level, but a negative relationship with cash conversion cycle. On the one hand, working capital and capital expenditure belongs to contrasting kind of assets, the higher level of one of them requires a lower level of the other due to the existence of financial constraints. On the other hand, cash holdings is supportive of the existence of capital expenditure, more cash available also requires more fixed assets for future need of growth and expansion. A slight difference between two types of firms is the heavier impact of profitability on financially unconstrained firms than on financially constrained firms. This implies that the more profitable firms with stable financial strength, the more cash they intentionally hold to reinforce the certainty of their profit. The study result provides speculative motive of cash holdings as well as the emphasis of financial constraints on the adjustment of working capital investment in the real estate industry.

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More than a Fair Share? Principal-Principal Conflicts in Emerging Markets: Evidence from India

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Abstract

The concentrated ownership structure of emerging market firms may help mitigate principal-agent conflicts; however, the presence of two sets of principals, promoters with controlling stake and dispersed shareholders, may give rise to principal-principal conflicts. India, where firms are largely organized as business groups, with stock pyramids and complex cross-ownership structures, presents a distinctive venue to study the presence of such conflicts. This paper tests if the principal-principal conflicts transpire in the form of risk aversion when Indian bidders seek to merge or acquire. We observe that Indian bidders resort to risk-aversion only when promoters have high cash flow rights, that is, when they hold a majority stake in the acquiring firm. We argue that in business group firms this is likely to happen due to 'tunnelling distortion', whereas in standalone firms, this is likely to occur due to 'portfolio concentration'. However, on investigating deal-announcement returns, we observe that firms with high promoter ownership create value.

Keywords: principal-principal conflicts, agency theory, India, M&A, ownership concentration, promoter-manager, risk-taking behaviour

1. Introduction

The classic agency-theory that stems from the disharmony of interests and goals of principals and agents (Jensen & Meckling, 1976) is well suited to address corporate governance concerns in the countries where the stock-ownership is dispersed. However, business settings where the high concentration of ownership is predominant, call for addressing governance issues through the lens of principal-principal conflicts (Young, Peng, Ahlstrom, Bruton, & Jiang, 2008).

In emerging markets, factors like concentrated and complex ownership structures, weak shareholder protection, and institutional voids, give rise to conflicts between the majority and minority shareholders (Young et al., 2008). India presents a unique venue to test the presence of such conflicts. In Indian firms, promoters have high ownership stakes, and also control the management of the firm (we label them promoter-managers). Furthermore, the pyramidal-stock ownership structure (Note 1) enables promoters to have greater control compared to their cash flow rights in a lower level business group firm as well (Khanna & Palepu, 2000a). As a consequence of this phenomenon, two sets of shareholders emerge. One set of shareholders are the promoter-managers, whereas, the other set of shareholders have a substantial yet minority stake in the firm, but are widely dispersed to have any significant say in management's decisions. In such a setting, there is a greater possibility for the promoter-managers to ignore the interests of the minority shareholders, which could give rise to principal-principals conflicts (Dharwadkar, George, & Brandes, 2000; Morck, Wolfenzon, & Yeung, 2005).

The classical agency literature assumes that managers are opportunistic; and there is extant empirical evidence that suggests that the managers have a tendency to make suboptimal risk choices (entrenchment hypothesis, Shleifer & Vishny, 1989). A widely acknowledged reason is the non-diversifiable employment risk faced by a manager (Amihud & Lev, 1981). Besides, making risky investments can also limit a manager's rent seeking ability (perquisite consumption) since it requires more prudent use of the firm's resources (Jensen, 1986, 1993). Such managerial opportunism is addressed by effective incentive design and compensation structure that includes equity and option holdings (based on the incentive alignment hypothesis). This approach is based on the premise that high equity ownership of managers can help mitigate the risk-avoidance resorted to, by them. Now, since, most of the Indian firms already have promoter-managers (Note 2), that is, managers with high equity stakes, we believe it would be interesting to study if their risk-related behaviour favours all the shareholders including the dispersed shareholders, when they make external corporate investment decisions, or they resort to risk aversion in the same fashion as their western counterparts.

In this paper, we test if the principal-principal conflicts transpire in the form of risk aversion when Indian bidders seek to merge or acquire. Therefore, we assess the risk-taking behaviour of bidders in an emerging market, i.e. India. We observe that Indian bidders are undertaking value enhancing risky deals as long as the promoters do not hold majority stake (i.e., more than 50 per cent shares). The Indian bidders resort to risk-aversion when promoters hold majority stake, that is, when their cash-flow rights in a firm are more than fifty per cent. We posit that in business group firms this is likely to happen due to 'tunnelling distortion' whereas in standalone firms, this is likely to occur due to 'portfolio concentration'. However, on investigating the announcement returns of such deals, we observe that on an average the managers (promoter-managers) do not destroy value.

The paper is organized as follows: the next section presents the literature review and research objective; the third section presents the methodology; the fourth section presents the data and the sample selection; the fifth section presents the results and a brief discussion, and the sixth section presents our concluding remarks.

2. Literature Review and Research Objective

For our study, we have borrowed heavily from the literature on managerial opportunism, which addresses the concerns of the traditional agency problem observed in developed countries with dispersed ownership. But, we attempt to extend the new branch of agency theory literature which considers the conflict of interest between the majority and the minority shareholders (Dharwadkar et al., 2000), and is more relevant in the context of the emerging economies where high ownership concentration among the promoters is a classic feature of firm ownership (Young et al., 2008). In this study, we test the presence of principal-principal conflicts in India by employing the established empirical approaches used to study the traditional agency problems in developed countries, and hence we review this literature at length. A study similar to ours yet quite different in context is undertaken by Chen and Young (2010), who have found empirical evidence supporting the principal-principal agency concerns in Chinese state owned enterprises.

In their seminal work, Amihud and Lev (1981) consider the impact of managerial ownership on the firm diversification activity and propose the 'employment risk' argument to explain managerial risk-aversion. They suggest that since a manager's income is dependent on firm's performance, and she bears the non-diversifiable risk of losing her job, she is induced to reduce this risk by entering into conglomerate mergers.

Literature on managerial opportunism offers several behavioural explanations like the 'empire building' motivation (Jensen, 1986, 1993) and the 'hubris' hypothesis (Roll, 1986), which also help us understand why managers' act against their shareholders by making value-destroying decisions. Managers driven by empire building motivations like to have greater control over the firm's resources to derive larger private benefits, whereas, managers guided by their overconfidence (hubris) tend to make valuation mistakes.

The empirical literature in this area primarily explores the relationship between equity ownership, including stock option grants and other components of executive compensation, and managerial opportunistic behaviour (including entrenchment). Empirical studies by Lloyd, Modani, and Hand (1987), Morck, Shleifer, and Vishny (1990), and Saunders, Strock and Travlos (1990), support Amihud and Lev's (1981) conclusions. They observe that manager-controlled firms are more prone to diversifying their income streams, which implies risk-averse behaviour on the part of the managers. But Lane, Cannella, and Lubatkin, (1998) present contradictory evidence advocating that managers do not always exhibit risk aversion. In fact, they propose stewardship theory in support of managers' behaviour with respect to mergers and acquisitions. Similarly, Rose and Shepard (1997) show that due to the challenges and demands of the job that the CEOs of diversified firms are able to fetch greater salaries and bonuses than their counterparts in non-diversified firms, and not due to the entrenchment reasons. However, a more recent study by Shekhar and Torbey (2005) found evidence hinting managerial-opportunism in Australian M&A. They found that increased equity ownership leads to greater diversification; nevertheless, such diversification deals are not value destroying.

A strand of empirical literature on managerial opportunism explores the relationship between equity ownership and firm value. McConnell and Servaes (1990) observe a non-linear link between equity ownership by corporate insiders and firm value, with inflection point at the 40-50 per cent ownership level. A similar positive link is observed in Frye (2004), but Sesil, Kroumova, Kruse, and Blasi (2007) conclude such a link only in favour of stock options.

Another strand of literature uses M&A deal announcement abnormal returns as a tool to investigate managerial opportunism. Lewellen, Loderer, and Rosenfeld (1985) report higher abnormal returns on merger announcements for firms with higher insider (managerial) ownership, thus, implying that agency conflicts are reduced by increasing management's equity ownership. Cornett, Hovakimian, Palia, and Tehranian (2003) observe the negative investor reaction around diversification deal announcements by acquiring banks, thus, implying that agency concerns are not completely addressed through corporate governance mechanisms like equity & option holdings; however, Minnick, Unal, and Yang (2011) observe contradictory results for small & medium sized banks.

A considerable stream of literature on managerial opportunism investigates the risk taking behaviour of insiders (i.e. managers) given their equity ownership and/or compensation structure. Agrawal and Mandelker (1987) observe a positive relationship between the extent of stock & options held by the managers & their risk taking behaviour, but Lewellen, Loderer, and Rosenfeld (1989) find very weak evidence in support of this view.

The aforementioned discussion suggests that the literature in this area has evolved over the years but the final word is yet to be said. There are conflicting evidences with regards to equity and option ownership by the insiders/managers/executives and its impact on firm's long term growth strategies like acquisitions (related or unrelated) and idiosyncratic risk. Moreover, over time the authors have considered different components of executive compensation, board structure, presence of block holders and other corporate governance mechanisms to study the dynamics of managerial risk taking.

High promoter ownership in Indian companies makes it a classic case to study the above inter-linkages from the perspective of principal-principal agency. In the light of the above discussion, we undertake this study to test if we observe managerial opportunism in the form of principal-principal agency in Indian companies when they make external corporate investment decisions. Firstly, we address this inquiry by analysing the impact of high ownership concentration on the risk-taking behaviour of its management, i.e., we test if M&A deals by highly concentrated bidders lead to decrease in post-deal risk (idiosyncratic). Subsequently, we study the acquisitiveness (M&A activity) of highly concentrated bidders. Our objective is to test the impact of promoter holdings on their M&A activity. M&A activity is another proxy for risk, and it mirrors the idiosyncratic risk proxy. And thirdly, we study if the firms with potential for the presence of principal-principal conflicts make value-creating or value-destroying acquisitions.

3. Methodology: Risk Taking Behaviour of the Bidders: Tobit and Negative Binomial Regression

To study the promoters, or managers, risk taking behaviour, we consider the ratio of post-deal risk over the pre-deal risk (Lewellen et al., 1989, Williams & Rao, 2006). Since our dependent variable is the standard deviation of security returns (absolute and market-adjusted), the value of this measure cannot go below zero, that is, the response variable is bounded on the lower side. Hence, based on the characteristic of our dependent variable, the model that we test is a corner-solution model, and the use of the ordinary least square regression would not be appropriate, since it can give us negative predictions. Thus, we employ tobit regression analysis, which is a hybrid of the OLS regression and the probit regression analysis (Note 3).

$$Post - deal\ Risk\ over\ Pre - deal\ Risk_i = \alpha + \beta_1 Insider\ Own_i +$$

$$\beta_2 Insider\ OwnOnsider\ rscrease\ in\ post\ vior.ion, atio\ of\ director'o\ \ use\ the\ ratio\ of\ and\ thesis\ concerning\ the\ presence\ of\ prinicpal -$$

$$ter_i^2 + \beta_3 Rel\_FF_i + \beta_4\ Controls_i\ (eg. Log\ Deal\ Size, Acq\_Percent, DE, BG, Post\_1991, industry\ effects, year\ effects) \quad (1)$$

For the pre-deal period risk calculation, we calculate the risk variable over a period of 180 days starting 30 days before a deal, and for the post-deal risk calculation, we measure risk variable over a 180 day period starting 11 days after the completion of a deal (Williams & Rao, 2006).

$Insider\ Own_i$ is the proxy for promoter holdings. We have used two proxies of insider owners in our analysis on the idiosyncratic risk, and six proxies of the same variable in our analysis on M&A Activity. We have also employed a squared variable of each of the insider ownership proxies because this variable is likely to have a curvilinear relationship with the risk measure. This curvilinear relationship is suitably captured by introducing a squared term of the insider ownership measure.

We also employ another model to test the risk taking behaviour of insider owners. In this model, we employ the number of M&A deals, termed as M&A activity (overall, and only diversification only, i.e., deals in unrelated industries), by bidders in ten years prior to a given deal announcement as the dependent variable. The response variable in this model is a count variable, and hence we employ negative binomial regression analysis to estimate the following model:

$$M\&A\ Activity_i(total\ activity) = \alpha + \beta_1 Insider\ Own_i + \beta_2 Insider\ OwnOnsider\ rscrease\ in\ post\ vior.ion, atio\ of\ director'o\ use\ the\ ratio\ of\ and\ thesis\ concerning\ the\ presence\ of\ prinicpal - ter_i^2 + \beta_3 Rel\_FF_i + \beta_4\ Controls_i\ (eg. Log\ Assets, DE, Post\_1991, industry\ effects, year\ effects.) \quad (2)$$

$$M\&A\ Activity_i(in\ unrelated\ ind.) = \alpha + \beta_1 Insider\ Own_i + \beta_2 Insider\ OwnOnsider\ rscrease\ in\ post\ vior.ion, atio\ of\ director'o\ use\ the\ ratio\ of\ and\ thesis\ concerning\ the\ presence\ of\ prinicpal - ter_i^2 + \beta_3 Rel\_FF_i + \beta_4\ Controls_i\ \text{(eg. Log Assets, DE, Post\_1991, industry effects, year effects.)} \quad (3)$$

The dependent variable in models 2 and 3 is the mirror image of the risk proxy used in the model no. 1. In these models (2 and 3), the increase in the dependent variable would suggest risk aversion, whereas, an increase in the dependent variable of model 1, would suggest greater risk taking. We have kept all the independent variables in the model 1, 2 and 3 as the same; however, we have deleted some of the control variables not relevant for M&A activity models (model no. 2 and 3).

Table 1. Statistical properties of key variables (used for risk analysis)

Variable	N	Mean	Median	Stdev	Max	Min	Q1	Q3
Var Ratio	224	1.0179	0.9687	0.4043	2.8801	0.1307	0.7262	1.2722
Mkt. Adj. Var Ratio	224	0.9802	0.9737	0.1763	1.5255	0.3495	0.8719	1.1011
Deal Value	224	83.292	12.708	226.646	1691.064	0.002	3.774	43.862
Percent Acq	224	0.6582	0.6767	0.3176	1.0000	0.1000	0.3925	1.0000
Percent Owned	224	0.7637	0.9107	0.2791	1.0000	0.1000	0.5105	1.0000
Insider Own Proxy1	224	0.4712	0.4625	0.1887	0.8950	0.0000	0.3419	0.6144
Insider Own Proxy2	224	0.4544	0.4522	0.2000	0.8950	0.0000	0.3182	0.6099
Insider Own Proxy3	224	0.4017	0.3977	0.2167	0.8950	0.0000	0.2628	0.5406
Insider Own Proxy4	224	0.6828	0.7016	0.1701	0.9783	0.0412	0.5714	0.8035
Insider Own Proxy5	224	0.5734	0.5745	0.1817	0.9655	0.0369	0.4612	0.7000
Insider Own Proxy6	224	0.3283	0.3377	0.2463	0.8950	0.0000	0.0797	0.5005
Debt	203	20390.04	2134.30	72740.16	739044.80	0.50	595.90	9810.90
DE	224	0.7021	0.5000	0.9540	10.2200	0.0000	0.1150	0.9500
Debt_cost	214	0.0897	0.0755	0.0839	0.6718	0.0000	0.0469	0.1057

Note. This table presents summary statistics of key variables used in the Risk analysis using regression model. The definitions of the variables are presented in Appendix A.

3.1 Variability in Returns as a Measure of Risk

In this study, we consider variability in bidder's stock returns as one of the measures of risk. We employ two different measures of risk, a. raw standard deviation of stock returns, and b. market adjusted standard deviation of stock returns. The first measure is the overall variability in stock returns, whereas the second measure, that is, the residual standard deviation of returns (market adjusted standard deviation of returns), represents an estimate of the firm's unsystematic risk. Lewellen et al. (1989) and Williams and Rao (2006) have employed these measures of risk to study the impact of management's stock ownership and options holdings on firm risk.

3.2 M&A Activity as a Measure of Risk

Amihud and Lev (1981) have looked at M&A activity of bidders to assess the managerial motive for conglomerate mergers. Thus, borrowing from their paper, we have used M&A activity, that is, the number of M&A deals by a bidder in ten years prior to a given deal, as another proxy for risk. We have also considered M&A deals by a bidder only in unrelated industries. Increased M&A deals suggest risk-reduction behaviour on part of the manager, and vice versa. To capture this measure we have excluded those deals where only assets were acquired. We have also excluded the deals where the percentage of stake acquired was less than ten.

In Table 1B, we have presented a summary of total deals undertaken by Indian acquirers classified as per insider-ownership bucket they belong to. This table clearly shows that M&A activity, overall and unrelated, is high at lower insider ownership levels, but decreases when the ownership of promoters is more than 25 per cent. This observation suggests that the classical agency problem, the principal-agent problem is mitigated by increasing insider ownership. However, when this insider ownership is more than 50 per cent, the table suggests that there is a slight increase in M&A activity, indicating the presence of principal-principal conflict. We substantiate this claim by undertaking the negative binomial regression analysis, and the results are discussed in section 5.

Table 1B. M&A Activity as per different insider ownership buckets

	Insider Ownership (Proxy1)			
M&A activity in 10 years	Less than 10%	10% to 25%	25% to 50%	Greater than 50%
Sum of No. of deals	36	26	104	111
Average of No. of deals	5.14	2.17	0.95	1.17
Sum of No. of Unrelated Deals	22	19	44	52
Average of No. of Unrelated Deals	3.14	1.58	0.40	0.55

Note. This table presents the total and the average of M&A activity undertaken by all the Indian acquirers in our sample, classified as per different Insider Ownership buckets. Our objective is to observe the M&A activity by acquirers falling in certain Insider-Ownership bucket, and also to see if with increase / decrease in insider-ownership, the acquisitiveness of acquirers varies. M&A activity is the number of M&A deals by an acquirer in 10 year prior to a deal announcement.

3.3 Insider Ownership

Insider Own Proxy1, captures the total promoter holdings, including holdings by persons acting in concert as promoters. Insider Own Proxy2, represents the sum of holdings by all the Promoters, Indian as well as foreign. Insider Own Proxy3, captures the total of Indian Promoters and persons acting in concert as promoters. Insider Own Proxy4, captures holdings by promoters as well as non-promoter institutions like mutual funds, UTI (Unit Trust of India), insurance companies, etc. Insider Own Proxy 5 captures the total percentage of Promoters and non-promoter FIIs' holdings. Insider Own Proxy6 captures the sum of holdings by Indian promoters. Thus, we employ different combinations of promoter and non-promoter holdings to capture the insider ownership effect.

3.4 Industry Relatedness

Corporate diversification is the diversification of the firm specific risk, also called the idiosyncratic or the unsystematic risk. As per modern portfolio theory, the unsystematic risk can be managed by the way of diversification and hence should not reflect in the investor's valuation of a firm, however, corporate strategy research differs on this conclusion. In the words of Bettis (1983), '*Modern financial theory suggests that the equity markets will not reward unsystematic risk management, but unsystematic risk management lies at the heart of strategic management'*. Thus, Bettis (1983) has put forward an important conundrum faced by academic researchers in the area of modern financial theory and corporate strategy. The empirical research in these fields is yet to agree on a common conclusion, since some research supports the diversification discount hypothesis (Rajan, Servaes, & Zingales, 2000; Laeven & Levine, 2007), whereas other body of work suggests that diversification creates value (Villalonga, 2004; ref. Martin & Sayrak, 2003), for a detailed review of the literature on this issue).

We employ a dummy variable on industry relatedness to separate diversification deals from the deals in the related industries. The diversification research has presented different ways of identifying related and unrelated deals; the most common approach is the use of SIC codes. Researchers have looked at the first two, the first three or the first four digits of the SIC to identify a diversification deal. We did employ this technique of identifying the diversification deals by considering the first three digits of the SIC, but found the industry sector segregation as provided Fama-French was a more reliable indicator of the relatedness of a deal. Thus, based on the Fama-French forty-nine industry classification, if the deals are in different industries, then the dummy value of relatedness for the risk analysis part (tobit regressions) is one.

3.5 Age Group

There are five age groups of companies reported on prowess based on the year of incorporation of the firm: a. before 1950, b. between 1951 and 1971, c. between 1972 and 1985, d. between 1986 and 1990, and e. after 1991. Each group represents a different economic environment with respect to industrial licensing, stringency of controls over growth in size, economic reforms, etc. (Note 4). Academic research has shown younger firms are greater risk-takers than the older firms (Fink et al., 2004). Thus, we have considered the 'after-1991' age group category provided by prowess as an independent variable to identify younger firms.

3.6 Other Controls

Leverage: We have used debt-equity ratio as one of the control variables, since it is an important determinant of stock return volatility (Guay, 1999). Increase in leverage leads to increase in risk. We have used the square root of the debt-equity ratio of the acquirer, since this transformation helps us make the variable more normally distributed.

BG: Business Group (BG) affiliation is a significant factor unique to emerging economies, and to capture the effect of this factor on the risk taking behaviour of its affiliates we employ a dummy variable to identify the business group affiliated firms in our model.

Industry Controls: We have used control variables to isolate industry effects on the risk-taking behaviour of bidders. We have controlled for three relevant industries, namely, a. Construction material, building/construction and engineering, b. IT consulting and services, and software, and c. oil and gas, petrochemicals, power and other energy and power.

Year Effects: We have controlled for 2008 and 2009, because after 2007 there was a sharp drop in M&A activity in India due to the global economic downturn.

3.7 Measuring Abnormal Returns

For studying the announcement effects of deals done by firms with high promoter holdings versus the firms with low promoter holdings, we use the event study methodology (Brown & Warner, 1985; MacKinlay, 1997). We use the market model to estimate the returns, and observe the difference between the actual return and the expected return as the abnormal return. We capture these abnormal returns over different event windows. The market model that is estimated over 200 days is:

$$E(R_{it}) = \alpha + \beta\, R_{mt} \tag{4}$$

The abnormal return is captured as:

$$AR_{it} = R_{it} - E\,(R_{it}) \tag{5}$$

The abnormal return is then aggregated over different event window, where T represents the length of the window:

$$CAR_i^T = \sum_{t=t_1}^{t_n} A\,R_{it} \tag{6}$$

The $E(R_{it})$ is the expected return from the market model for a bidder I, and R_{mt} is the return on market portfolio for day t. R_{it} is the actual return of the bidder i for time t. AR_{it} is the abnormal return for the event i on the day t. CAR_i^T is the cumulative abnormal return for the event window T, from day t_1 to t_n.

4. Data

Our data set comprises mergers and acquisition deals by Indian acquirers from 2001 to 2010. The data on mergers and acquisition deals in India and also the stock price data (for the event study) are taken from Thomson Reuters' Thomson One database. We have taken bidder's company financial information from the CMIE's Prowess (Note 5) database.

Table 2. Pairwise correlation coefficients of key variables

Variables	Var Ratio	Mkt. Adj. Var Ratio	Deal Value	Acq_percent	Percent Own	Insider Own Proxy1	Executive Director Comp	Manag-erial Comp	Debt	DE
Mkt. Adj. Var	0.92	1								
Ratio	(0.00)									
Deal Value	0.12	0.09	1							
	(0.07)	(0.16)								
Acq_percent	-0.04	-0.06	-0.09	1						
	(0.52)	(0.35)	(0.19)							
Percent Own	-0.06	-0.06	-0.02	0.73	1					
	(0.40)	(0.37)	(0.71)	(0.00)						
Insider Own	0.07	0.11	0.16	0.09	-0.03	1				
Proxy1	(0.31)	(0.09)	(0.02)	(0.20)	(0.61)					
Exec. Director	0.01	0.01	0.37	-0.11	-0.02	0.08	1			
Compensation	(0.93)	(0.86)	(0.00)	(0.19)	(0.82)	(0.31)				
Managerial	-0.04	-0.04	0.35	-0.12	0.00	0.02	0.98	1		
Compensation	(0.58)	(0.61)	(0.00)	(0.09)	(0.98)	(0.82)	(0.00)			
Debt	-0.05	-0.05	0.56	-0.20	-0.01	0.15	0.45	0.42	1	
	(0.50)	(0.48)	(0.00)	(0.00)	(0.90)	(0.03)	(0.00)	(0.00)		
DE	0.05	0.05	-0.01	0.06	-0.01	0.07	-0.03	-0.05	0.03	1
	(0.44)	(0.42)	(0.91)	(0.38)	(0.88)	(0.32)	(0.72)	(0.50)	(0.71)	

Note. This table reports pairwise correlation coefficients of key variables used for Risk Analysis. p-values are reported in the parenthesis.

For our study, we have considered deals done by Indian acquirers; so, these deals are domestic and cross border as well. We have filtered only the completed deals; hence the deals that were announced but were terminated, are out of the purview of our study.

We exclude the following types of deals: the acquisition of assets, buybacks, bankruptcy acquisitions, and divestiture. We also exclude those deals where acquirer is an investor group, deals where the value of the transaction is undisclosed or unavailable, deals by private firms, government owned enterprises and by financial firms.

There are deals that are announced in parts, i.e., the deals where the acquirer and the target is same, but the deal value and other deal characteristics differ. In such cases of multiple announcements, we have included the deal with the highest percentage acquired. We have filtered out the deals where the percentage acquired is less than ten. However, to be included in our data set, a deal must have all the required data with respect to closing stock prices and other financial variables used in the study.

5. Results and Discussion

A large number of Indian businesses are organized as business groups as a consequence of India's business history and the institutional voids that are generally observed in the emerging markets (Khanna & Palepu, 2000b). Most of these business groups are family owned with high promoter holdings, as a classic feature of their ownership structure (Huchet & Ruet, 2006). On one hand, there is a likelihood of tunnelling in business groups (Bertrand, Mehta, & Mullainathan, 2002, Khanna & Rivkin, 2001), that is, the expropriation of wealth from minority shareholders and channelling them to the group affiliated under-performing firms (Shleifer & Vishny, 1997); whereas, contrary to this, there is empirical evidence in favour of family businesses that suggests that such firms do not destroy value on making acquisitions (Caprio, Croc, & Del Giudice, 2011). Our empirical study sample comprises family owned business-group affiliated firms and stand-alone firms. Thus, in our opinion, undertaking this study has helped us understand the risk-taking behaviour of these firms across different ownership structures, and more importantly has helped us gather empirical evidence related to principal-principal conflicts arising due to the aforementioned ownership structures.

5.1 Risk Taking Behaviour of the Bidders: Tobit Regression Analysis, and Negative Binomial Regression Analysis

To understand the risk taking behaviour of bidding firms, we study the changes to firm risk after an acquisition or a merger deal, and if these changes are related to the ownership structure of the bidder. We also look at the past deal activity levels (M&A activity -total and in unrelated industries) by bidders as another proxy for the risk-taking. Thus, we undertake an inquiry in to the risk-taking behaviour of insider owners which would help us make informed conclusions on the principal-principal dynamics at play in Indian companies.

As discussed in the methodology section, we have employed different proxies of insider ownership and have also considered the squared term of each of the proxies to capture the curvilinear relationship between the risk measure and insider ownership. The market-adjusted measure of risk is a better measure for our regression analysis as compared to the raw measure since the same reflects the firm specific risk.

The models III and IV (in Table 3) report results on regression models that use the overall standard deviation of stock returns as the response variable, whereas, the models I and II report the results on regression models that use the market-adjusted standard deviation of returns as the response variable. Table 4 and 5 report results on the overall M&A activity and the activity in unrelated industries, respectively; different columns represent models using different insider ownership proxies.

The relationship of the insider ownership with risk is non-linear in nature; the coefficients of the insider ownership proxy term and its squared term (Table 3) suggest that the relationship is positive up to an inflection point, after which the relationship turns negative. Thus, the insider owners undertake risky investments up to a certain level of their holdings, but if their holdings are more than that level, they tend to resort to risk-avoidance (in case of the model I, this turning point is at 45.07 percentage holdings of insider owners (Note 6)). This means that up to a level of insider holdings, principal-principal conflicts are well prevented, but if insiders own stake beyond the majority threshold of close to 50 per cent, we can expect principal-principal conflicts to be present. We observe that the same curvilinear relationship is present in the risk models (Table 3) and also the M&A activity models (Table 4 and 5). The signs of the coefficients of the insider-ownership proxy and its squared term in the M&A activity model are exactly opposite to the signs in the risk model.

Table 3. Bidder risk taking and insider ownership - Tobit regression

Variables	Market Adj. Risk -Model I	Market Adj. Risk - Model II	Risk –Model III	Risk –Model IV
insiderown_proxy6	0.302**		0.3710	
	[0.017]		[0.241]	
insiderown_proxy6_sqr	-0.335**		-0.4230	
	[0.046]		[0.328]	
insiderown_proxy2		0.412**		0.6920
		[0.032]		[0.121]
insiderown_proxy2_sqr		-0.380*		-0.6610
		[0.071]		[0.189]
Rel_FF	0.02610	0.02410	0.03310	0.03050
	[0.224]	[0.266]	[0.527]	[0.563]
Log_deal_size	0.0101**	0.0112**	0.0300**	0.0318***
	[0.030]	[0.022]	[0.011]	[0.009]
Acq_percent	-0.0438	-0.0469	-0.0557	-0.0650
	[0.248]	[0.209]	[0.497]	[0.429]
DE	0.0246	0.0349	0.0765	0.0876*
	[0.254]	[0.104]	[0.120]	[0.071]
BG	-0.0517**	-0.0452**	-0.0852	-0.0774
	[0.018]	[0.036]	[0.104]	[0.131]
Post_1991	0.0364	0.0400*	0.0664	0.0684
	[0.136]	[0.098]	[0.244]	[0.229]
ConsMatBldg	0.0412	0.0497	0.1090	0.1280
	[0.213]	[0.161]	[0.173]	[0.110]
ITConltServ	0.0075	0.0203	0.0329	0.0517
	[0.808]	[0.521]	[0.653]	[0.492]
OilGasPow	-0.0040	-0.0084	-0.0195	-0.0212
	[0.907]	[0.814]	[0.809]	[0.797]
Yr._2009	-0.183***	-0.177***	-0.391***	-0.385***
	[0.000]	[0.000]	[0.000]	[0.000]
Yr._2008	0.0805***	0.0837***	0.150**	0.149**
	[0.005]	[0.004]	[0.030]	[0.033]
Sigma	0.152***	0.153***	0.361***	0.361***
	[0.000]	[0.000]	[0.000]	[0.000]
Pseudo R-Sq	-0.4500	-0.4430	0.2150	0.2190
F	6.5230	6.5160	5.3930	5.3720
p	0.0000	0.0000	0.0000	0.0000
LL	103.60	103.10	-89.85	-89.44

Note. This table presents the results of the tobit regression analysis on the risk taking behaviour of insider owners. We have used robust standard errors method while estimating the model: $Post - deal\ Risk\ over\ Pre - deal\ Risk_i = \alpha + \beta_1 Insider\ Own_i +$ β_2 Insider Ownrscrease in post vior. ion, atio of director′o use the ratio of and thesis concerning the presence of prinicpal − ter_i^2Onsider $+ \beta_3 \mathrm{Rel\_FF}_i + \beta_4\ \mathrm{Controls}_i$. P-values are in the parentheses. * p<0.1, ** p<0.05, *** p<0.01. Risk is the square root of the ratio of variances after and before the deal. Market adjusted variances is the ratio of the variables after and before the deal adjusted for market wide variance. The total number of observations in the following models is 224.

In the Anglo-American context, we do find some empirical evidence where insider ownership has non-linear relationship with risk taking (Wright, Kroll, Lado, & Van Ness, 2002), and also, firm value (McConnel & Servaes, 1990). This relationship is comprehensible if one considers the fact that a professional manager's employment risk is non-diversifiable. However, the non-linearity observed (between risk/M&A activity and insider ownership) in the Indian corporate risk-taking is interesting, yet puzzling.

The manager in Indian companies is oftentimes an insider, that is, a promoter. Such an owner-manager, who is an entrepreneur, doesn't face the non-diversifiable employment risk. Although, one could argue that his wealth might be ill-diversified since the substantial part of his wealth is invested in a single firm. However, this argument of 'portfolio concentration' would hold only for the stand alone companies, i.e., the companies that are not affiliated to any business group. Such companies form one-third of our sample.

Table 4. Bidder M&A activity and insider ownership - negative binomial regression

Variable	insiderown_ proxy1	insiderown_ proxy2	insiderown_ proxy3	insiderown_ proxy4	insiderown_ proxy5	insiderown_ proxy6
insiderown	-4.383***	-3.112**	-3.842***	-7.339***	-4.944***	-1.1410
	[0.003]	[0.024]	[0.000]	[0.000]	[0.010]	[0.227]
insiderown_sqr	4.142***	2.994**	3.845***	5.342***	3.694**	1.1710
	[0.006]	[0.037]	[0.003]	[0.001]	[0.037]	[0.337]
Rel_FF	0.0203	0.0044	0.0162	-0.0830	-0.0281	-0.0219
	[0.905]	[0.979]	[0.924]	[0.598]	[0.865]	[0.902]
Log_Assets	0.272***	0.282***	0.301***	0.314***	0.296***	0.303***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
DE	0.0424	0.0342	0.1920	0.0642	-0.0033	0.0818
	[0.795]	[0.832]	[0.200]	[0.686]	[0.984]	[0.580]
Post_1991	-0.1190	-0.1290	-0.0650	-0.1020	-0.0994	-0.1450
	[0.582]	[0.548]	[0.764]	[0.632]	[0.647]	[0.508]
ConsMatBldg	0.411**	0.521***	0.454**	0.767***	0.488**	0.656***
	[0.046]	[0.009]	[0.026]	[0.000]	[0.014]	[0.001]
ITConltServ	0.776***	0.854***	0.963***	0.640***	0.711***	0.999***
	[0.003]	[0.003]	[0.001]	[0.005]	[0.003]	[0.002]
OilGasPow	0.0161	0.0080	-0.0816	-0.0133	0.0671	-0.0274
	[0.952]	[0.976]	[0.747]	[0.959]	[0.792]	[0.913]
Yr._2009	0.2960	0.2740	0.1890	0.2460	0.2550	0.2130
	[0.108]	[0.136]	[0.280]	[0.175]	[0.155]	[0.241]
Yr._2008	0.1670	0.1530	0.0958	0.1600	0.1580	0.1020
	[0.481]	[0.521]	[0.684]	[0.488]	[0.504]	[0.668]
lnalpha	-0.819***	-0.733**	-0.858***	-0.978***	-0.864***	-0.653**
	[0.006]	[0.011]	[0.006]	[0.003]	[0.005]	[0.027]
N	204	204	204	204	204	204
pseudo R-Sq	0.0930	0.0870	0.0970	0.1030	0.0940	0.0810
Chi-Sq	80.870	78.090	89.790	74.010	71.680	70.440
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LL	-295.9	-297.7	-294.6	-292.7	-295.4	-299.7

Note. The overall M&A Activity is the dependent variable. This table presents negative binomial regression results for different models with different insider ownership proxies. The Model: $\text{M\&A Activity}_i = \alpha + \beta_1 \text{Insider Own}_i + \beta_2 \text{Insider Ownin post vior. ion, atio of director'o use the ratio of and thesis concerning the presence of prinicpal} - \text{ter}_i^2 \text{Onsider rscrease} + \beta_3 \text{Rel\_FF}_i + \beta_4 \text{ Controls}_i$ (eg. Log Assets, DE, Post_1991, industry effects, year effects.), is estimated using negative binomial regression analysis. P-values are in the parentheses. * p<0.1, ** p<0.05, *** p<0.01. The regression is estimated with White robust standard errors. The total number of observations in the following modes is 204.

The two-thirds of the firms in our sample are business group affiliated firms, where the promoter-manager has his wealth invested in other group companies as well. Although it is difficult to assess the extent of portfolio diversification thus attained by a promoter manager, the argument of investment concentration weakens. But, there is a possibility that a business group firm is resorting to ‘tunnelling’ (Morck & Yeung, 2003). This can be interpreted as an indication that it is likely that the promoter managers are doing more risky projects through the firms in which they have lower cash flow rights compared to the control exhibited. Therefore, it is probable that through the lower layer firms the promoters are taking more risks, tunnelling profits to higher layer firms when profits occur, but when losses are suffered, the lower layer firms absorb them. Since, higher layer firms are the ones where promoter holds higher stake, i.e., higher cash flow rights, these are the firms where risk-aversion is resorted to. Thus, the evidence of risk-reduction and increased diversification (& overall M&A) activity beyond a level of insider ownership around the majority-stake level, points to the astounding fact that these promoter-managers are pursuing goals that are different from the objectives of the minority (dispersed) shareholders.

We observe that deal size has a positive association with the risk measure, suggesting that the principal-principal conflict is more of a concern in the smaller sized deals, but the same is well avoided in the bigger deals. We have employed firm size measured as the log of total assets of bidder in the M&A activity model (Table 4 and 5), since in the context of deal activity, it is a more appropriate control variable than the deal size.

Table 5. Bidder M&A activity in unrelated industries and insider ownership - negative binomial regression

Variable	insiderown_proxy1	insiderown_proxy2	insiderown_proxy3	insiderown_proxy4	insiderown_proxy5	insiderown_proxy6
insiderown	-4.408**	-3.037*	-5.259***	-7.361**	-4.495	-1.5040
	[0.037]	[0.087]	[0.000]	[0.040]	[0.136]	[0.236]
insiderown_sqr	3.943*	2.783	4.695***	5.201*	3.0720	1.4640
	[0.064]	[0.134]	[0.007]	[0.061]	[0.260]	[0.333]
Rel_FF	0.3160	0.2780	0.3050	0.2040	0.2640	0.2360
	[0.177]	[0.235]	[0.178]	[0.351]	[0.241]	[0.320]
Log_Assets	0.274***	0.285***	0.313***	0.330***	0.306***	0.313***
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]
DE	0.0796	0.0804	0.3140	0.1030	0.0236	0.1610
	[0.727]	[0.720]	[0.107]	[0.639]	[0.918]	[0.438]
Post_1991	0.0902	0.0758	0.2510	0.1010	0.1080	0.0807
	[0.738]	[0.781]	[0.360]	[0.702]	[0.688]	[0.773]
ConsMatBldg	0.832**	0.967***	0.755**	1.195***	0.907***	1.098***
	[0.017]	[0.003]	[0.028]	[0.000]	[0.006]	[0.001]
ITConltServ	1.104***	1.209***	1.308***	0.944***	1.049***	1.384***
	[0.000]	[0.000]	[0.000]	[0.003]	[0.000]	[0.000]
OilGasPow	0.2030	0.1890	0.1090	0.1350	0.2230	0.1520
	[0.575]	[0.605]	[0.753]	[0.715]	[0.530]	[0.664]
Yr._2009	0.453*	0.4190	0.2570	0.3740	0.4030	0.3400
	[0.086]	[0.111]	[0.216]	[0.137]	[0.119]	[0.171]
Yr._2008	0.1910	0.1810	0.1210	0.2150	0.1900	0.1510
	[0.573]	[0.600]	[0.714]	[0.532]	[0.580]	[0.658]
lnalpha	-0.2370	-0.1680	-0.4780	-0.2490	-0.2510	-0.0838
	[0.454]	[0.588]	[0.186]	[0.435]	[0.426]	[0.783]
N	204	204	204	204	204	204
pseudo R-Sq	0.1000	0.0950	0.1210	0.1030	0.1000	0.0920
Chi-Sq	55.290	53.360	73.130	55.310	52.620	55.690
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LL	-203.7	-204.9	-199	-202.9	-203.8	-205.6

Note. The M&A Activity in unrelated industries is the dependent variable. This table presents negative binomial regression results for different models with different insider ownership proxies. The base model: $\mathrm{M\&}A\ Activity_{\mathrm{i}} = \alpha + \beta_1 \mathrm{Insider\ Own_i} + \beta_2\ \mathrm{Insider\ Ownrscrease\ in\ post\ vior.ion, atio\ of\ director'o\ use\ the\ ratio\ of\ and\ thesis\ concerning\ the\ presence\ of\ prinicpal - ter_i^2Onsider} + \beta_3 \mathrm{Rel_i} + \beta_4\ \mathrm{Controls_i}$, is estimated using negative binomial regression. P-values are in the parentheses. * p<0.1, ** p<0.05, *** p<0.01. The regression is estimated with White robust standard errors. The total number of observations in the following modes is 204.

Industry relatedness is a dummy variable employed to separate diversification deals from the deals in the related industries. The proponents of portfolio theory under the aegis of modern financial theory have always considered diversification as a means of reducing unsystematic risk (Wagner & Lau, 1971, Statman, 1987). However, Lubatkin and O'Neill (1987) have argued and empirically shown that the implications of the portfolio theory fail to hold when corporations diversify. In the words of Lubatkin and O'Neill (1987), '*Diversification will not reduce unsystematic risk because management actions may alter the underlying risk profiles of combining businesses'.* They argue that the success of a diversification deal depends largely on a manager's ability to handle the process. Our results on the industry relatedness (Table 3) –show positive relationship between the diversification deals and the risk-taking behaviour of bidders, however, the coefficient is not significant. Moreover, this co-efficient shows the negative relationship with risk measure in the M&A activity model, yet again it is not significantly different from zero. Hence, with respect to the diversification dummy (industry relatedness), we are unable to support either of the contradictory propositions (Wagner & Lau, 1971 versus Lubatkin & O'Neill, 1987).

We observe that higher debt-equity levels lead to greater risk taking (model IV), but the group affiliation makes them risk-averse (Table 3). An interesting result to be noted with respect to the control variables is the one with respect to the year dummy for 2009. In 2009, bidders exhibited risk aversion across all deals.

Fink, Grullon, Fink, and Weston (2004) have empirically shown that younger firms are risk takers, but our empirical analysis fails to support this view. In fact, the age of the firm has no significant effect on the risk behaviour of its managers (except in one case, Table 3).

5.2 Bidder Returns on M&A Announcements and the Promoter Holdings

We have presented a summary of significant cumulative abnormal returns (CARs) in Table 6, classified as per promoter holdings. When we segregate the bidder abnormal returns in three categories of promoter holdings, we observe significant positive abnormal returns in different event windows for those bidders who have promoter holdings above 26 per cent (ref. Table 6, significant mean values are in bold). Twenty-six per cent holding acts as an important cut-off since a shareholder can block special resolutions with shareholdings in excess of twenty-five per cent (as per Companies Act, 1956). Thus, for promoter holdings of twenty-six per cent or more, the deal announcement abnormal returns are persistently positive across different event windows leading up to the day of the announcement.

Table 6. Bidder abnormal returns and promoter holdings

No. of Obs.		Day 0	Day -1 to 0	Day -3 to 0	Day -5 to 0	Day -7 to 0	Day 0 to 1	Day 0 to 7	Day -1 to 1	Day -3 to 3	Day -2 to 0	Day -2 to 1	Day -3 to 1	Day -3 to -1
Panel I: Promoter Holdings<26%														
28	Mean	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.00	-0.01
	P-value	0.69	0.92	0.64	0.52	0.54	0.36	0.27	0.64	0.63	0.70	0.80	0.95	0.34
Panel II: Promoter holdings >= 26% but less than 50%														
112	Mean	0.00	**0.01**	**0.01**	**0.01**	**0.02**	0.00	**-0.01**	0.01	0.01	**0.01**	0.01	0.01	**0.01**
	P-value	0.14	0.04	0.03	0.04	0.07	0.65	0.06	0.20	0.43	0.08	0.28	0.11	0.10
Panel III: Promoter Holdings >= 50%														
137	Mean	**0.01**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	0.01	**0.02**	**0.01**	**0.02**	**0.02**	**0.02**	0.01
	P-value	0.00	0.00	0.00	0.02	0.08	0.01	0.43	0.01	0.04	0.00	0.01	0.01	0.11

Note. This table presents a summary of bidder abnormal returns, i.e., cumulative abnormal returns over different event windows. For example, event window 'Day -1 to 0' presents cumulative abnormal returns over two days – a day before the event and the event day. The segregation is based on the significant ownership thresholds, beyond which a shareholder can either block special resolutions (in case of ownership of 26 per cent or more), or has majority holdings (in case of 50 per cent or more). No. of obs. are the number of deals that satisfied the cut-off levels of promoter holdings. Mean –is the mean value of the cumulative abnormal returns over a given event window of all the observations.

6. Conclusion

In this study, we look at the agency theory relevant to emerging economies, which is called as the principal-principal agency conflict in the popular academic literature. There is extant empirical evidence pointing to opportunism undertaken by managers in the widely held Anglo-American companies. The primary driver for managers to resort to risk aversion is their employment risk which is non-diversifiable.

We undertake an inquiry into the risk-taking behaviour of promoter managers in an emerging economy, which presents us with a distinctive business setting with characteristics like high ownership concentration and complex structures -in the form of business groups with cross holdings and pyramidal arrangements. This context posits the possibility of the existence of the principal-principal agency between the dispersed shareholders and the majority shareholders.

On conducting an analysis on the risk-taking behaviour of bidders, we observe a curvilinear relationship between the insider ownership and the idiosyncratic risk of bidders. We observe a similar curvilinear relationship between high ownership concentration and the diversification activity (as well as overall M&A activity) undertaken by promoter-managers. The direct relationship between risk-taking behaviour and ownership concentration, and the indirect relation between diversification activity and insider ownership, is consistent with the theoretical predictions. However, the non-linearity in these relationships suggest that insider managers resort to risk aversion beyond the majority (or the near-majority) level of ownership.

The above evidence on risk-taking behaviour is quite intriguing, since the 'non-diversification of employment risk' argument doesn't hold for business-group firms which comprise two-thirds of our sample. But, the business-group affiliated firms have a tendency to resort to tunnelling, and that could be distorting their risk-taking behaviour. The promoter-manager could be using lower layers firms for undertaking risky projects, and cushioning the higher level firms (where higher stakes are held) from the downsides of risks. The cash-flow rights are much lower compared to the control held (through the pyramid) in the lower layer firms, and therefore, a promoter manager can do risky investments, tunnel the gains out, and distance himself from the burden of losses when suffered.

The above evidence suggests that principal-principal conflicts are likely to exist in Indian firms, especially in bidding firms with very high ownership concentration. However, on studying the abnormal returns on deal-announcements, we observe that when the Indian bidders with high ownership concentration announce M&A deals, they create value. Therefore, even if the deals undertaken by Indian acquirers reduce post-deal risk, such deals do not destroy shareholder wealth. Thus, the subsequent result on positive abnormal returns on deal announcements weakens the possibility of the presence of principal-principal conflicts that adversely affect shareholder wealth.

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Notes

Note 1. Pyramidal structure enables greater control in the hands of the insiders, over and above their cash flow rights (Porta et al., 1998).

Note 2. Promoter(s) (and the people acting in concert, i.e., friends, relatives, etc.) is a business promoter(s) and a shareholder(s) with substantial shareholding, and is more than likely the founder(s) of the enterprise. She has significant control over the affairs of the firm and therefore, she could be called the insider-manager or promoter-manager.

Note 3. For more details on this statistical method please refer: Soderbom, Mans and Teal, Francis. 2008. "Corner solutions, Censoring and Truncation." Available on: http://www.economics.ox.ac.uk/Intra/Grad/MSc/2007-08/QuantMethods/Lecture%20Notes_FJT/HT_Lectures_handouts/lec3ht_08_censoring.pdf. Accessed on 17th October, 2012.

Note 4. Source: Prowess, CMIE. http://prowess.cmie.com/, accessed on 17th October, 2012.

Note 5. CMIE is Centre for Monitoring Indian Economy. It provides company financial performance data for Indian companies through the Prowess Database.

Note 6. Since in this sample the turning point is close to the majority-holding threshold of 50 per cent, we can safely interpret this turning point to be at the majority threshold.

Appendix

Appendix A. Variable definitions

Acq_percent	The percentage of stake acquired in a deal
BG	A dummy variable to identify business group affiliated bidders; it assumes value 1 if an acquirer is a business group affiliated firm, otherwise it takes value 0
Cross Border	A dummy variable, which assumes value 1 if a deal is a cross border deal, otherwise it takes value 0.
ConsMatBldg	A dummy variable, which assumes value 1 if an acquirer's industry is construction material, building/construction and engineering
DE	The debt-equity ratio of an acquirer
Debt Cost	The cost of debt is measured as the ratio of interest expense and the average borrowings in the quarter before deal announcement.
Debt Cost Dummy	A dummy variable, which assumes value 1 if the acquirer's cost of debt before the deal announcement is more than the median cost of debt, 0 otherwise. The cost of debt is measured as the ratio of interest expense and the average borrowings in the quarter before deal announcement.
FIN	The method of financing for a deal, defined as a binary variable, assuming the value 1 if it is a stock offer, 0 if it is a cash offer
Insider Own or insiderown	The proxy for promoter holdings expressed as percentage of equity holdings by promoters.
Insiderown_sqr	The square of promoter holdings. If the proxy used for insider ownership is 'Insiderown_proxy1', then this term is denoted as 'insiderown_proxy1_sqr'.
Insiderown_Proxy1	The total promoter holdings, including holdings by the persons acting in concert
Insiderown_Proxy2	The sum of holdings by all the Promoters, Indian as well as foreign
Insiderown_Proxy3	The total of Indian Promoters and the persons acting in concert
Insiderown_Proxy4	The holdings by promoters as well as non-promoter institutions like mutual funds, UTI (Unit Trust of India), insurance companies, etc.
Insiderown_Proxy5	The sum of the holdings of Promoters and non-promoter FIIs
Insiderown_Proxy6	The sum of holdings by Indian promoters
ITConltSftw	A dummy variable, which assumes value 1 if an acquirer's industry is IT consulting and services, and software
Log_Assets	The log of bidder's total assets
Log Deal Size	The log of the transaction value
Market Adjusted Risk or Mkt. Adj. Var Ratio	The market adjusted standard deviation of stock returns are used to calculate this measure. This measure is a ratio of the post deal market adjusted standard deviation of returns over the pre-deal market adjusted standard deviation of returns. This variable is defined in section 3.
Merger	A dummy variable, which takes value 1 if the form of a deal is merger, otherwise it takes value 0
Non-Prom Hold	Percentage of outstanding shares held by non-promoters in a bidding company
OilGasPow	A dummy variable, which assumes value 1 if an acquirer's industry is oil and gas, petrochemicals, power, and other energy
Percent Acq26	A dummy variable based on the percentage of stake acquired in a deal. It assumes value 1 if the per cent acquired exceeds 26 per cent, otherwise it takes value zero
Percent Owned	The percentage of the target's outstanding shares held by an acquirer after the bid
Premium	The ratio of the offer price to the target's share price (four weeks prior to the deal announcement).
Prom Hold	Promoter holdings of an acquirer before deal announcement, expressed as a percentage of total outstanding shares.
Prom Hold Acq50	The percentage of promoter holdings for a deal if the percentage of stake acquired is 50 per cent or more. This variable assumes value 0 for the observations where the percentage of stake acquired is less than 50.
Post 1991	Companies that were established post 1991. This measure is provided by the CMIE's Prowess Database.
Recession Yr. Dummy	A dummy variable to identify recession years -2007, 2008 and 2009
Rel_FF	The industry relatedness dummy variable for a deal, assuming value 0 if the acquirer and the target are in the same industry, 1 otherwise. For determining whether a merger is happening in the same industry we have considered the 49 industry classification provided by Fama-French.
Rel Size	The relative size of a transaction, measured as the ratio of the value of the transaction over the market value of its acquirer.
Risk	The raw standard deviation of stock returns are used to calculate this measure. This measure is the ratio of the post deal standard deviation of returns over the pre-deal standard deviation of returns.
Sqrt DE	The square root of the acquirer's debt-equity ratio before deal announcement
Var Ratio	Post-deal risk over pre-deal risk as defined in section 3. The variance in this ratio is not market-adjusted.
Yr_2008	A dummy variable that assumes value 1 if the deal was announced in 2008
Yr_2009	A dummy variable that assumes value 1 if the deal was announced in 2009

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Investigating the Effect of Dividend Policy on the Wealth of Stockholders of Listed Companies on the Ghana Stock Exchange

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Abstract

This paper has examined the impact of dividend policy on the wealth of stockholders of selected registered companies on the Ghana Stock Exchange (GSE). Secondary data were collected on 25 listed firms using annual reports from 2005 to 2011. The dependent variable was wealth of stockholders proxied by market price per stock. The explanatory variables included dividend per stock (DPS), retained earning per stock (REPS), financial leverage (FLEV), and price earning ratio (PER). Fixed-effect model was fitted to the data. The regression results showed that dividend payment, retained earning, and price earning ratio have significant positive impact on the stock market price. It was also found that the impact of dividend is more pronounced than that of retained earning in the context of companies registered on the Ghana Stock Exchange. It is therefore recommended that optimal trade-off between dividend payment and retained earning be established by corporate management to maximise the wealth of stockholders.

Keywords: dividend policy, stock market price, stockholders, Ghana stock exchange

1. Introduction

To improve the wealth of stockholders and maximize corporate profits, corporate management formulates different financial policies for the corporation. These policies may be grouped into three i.e. investment policy, financing policy, and dividend policy. Of these three policies, dividend policy is central because it influences financing policy and financing policy in turn influences the choice of investment policy.

Since the 1950s the debate on the impact of dividend policy on stock market price has triggered many studies on the impact of dividend policy on stockholders value. Yet, the results are not conclusive. Some of the studies have reported that dividend policy has no influence on the wealth creation of stockholders (Uddin & Chowdhury, 2005; Adefila, Oladapo, & Adeoti; 2013). Others studies have also argued that dividend policy has impact on the wealth of stockholders (Khan, 2009; Salih, 2010; Joshi, 2011; Mohammad, 2013).

In the Ghanaian context, few studies have been conducted on dividend policy. A study by Amidu in 2007 reported that dividend policy has positive influence on the performance of firms listed on the Ghana Stock Exchange. Agyei and Marfo-Yiadom (2011) also found that banks that pay dividend increase their performance. Amidu and Abor (2006) studied factors influencing dividend payout ratios of registered companies. They reported that profitability, cash flow, and taxes were directly related to payout ratio, while growth and risk were inversely related to payout ratio.

Indeed, the Ghanaian economy appears to be performing well. Real Gross Domestic Product (GDP) growth increased from 7% in 2008 to 14.2% in 2011. The relatively high real GDP growth rate in 2011 was due to improvement in the export of cocoa, gold, and oil (Institute of Statistical, Social and Economic Research [ISSER], 2012). But in 2012, real GDP declined to 7.2% (Ghana Statistical Service [GSS], 2006-2012) and to 3.98% by 2014. It appears that the performance of the economy depends on the export sector which tends to be unstable. In fact, decline in real growth impacts negatively on consumption and employment rate. Thus, the Ghana Stock Exchange market becomes vital to growth and development because it is an instrument of capital mobilization. Certainly, more capital mobilization will provoke more investment in Ghana. More investment will increase not only real GDP but also consumption; more jobs will be created for both skilled and unskilled labour in the country.

In this regard, further investigation into the impact of dividend policy on the wealth of stockholders of companies registered on the Ghana Stock Exchange is justified. This paper is expected to aid managers of businesses and policy makers to identify the major factors influencing the wealth of stockholders and thus lead to policies that will attract many investors both locally and externally to invest in Ghana.

2. Review of Past Studies

Studies about the impact of dividend policy on the wealth of stockholders are many (Friend & Puckett, 1964; Kumar & Mohan, 1975; Brigham, 1995; Amidu, 2007; Salih, 2010; Mohammad, 2013; etc). Friend and Puckett (1964) examined the impact of dividends and retained profits on stock prices. Using three industries, Friend and Puckett (1964) showed that dividends have greater impact on stock prices than that of retained profits. In a study by Dhanani (2005), the author reported that dividend policy is significant in stock price measurement. Dhanani (2005) argued that a company's dividend policy can influence at least one of the defectiveness in the real world such as information asymmetry, agency problems, taxes and transaction costs which in turn, appreciate the stock price.

In South India, Azhagaiah and Priya (2008) studied the impact of dividend policy on stockholders' value using a sample of twenty-eight chemical companies listed on the Bombay Stock Exchange (BSE). Multiple and stepwise regression was applied to the data which covered the period 1997-2006. Azhagaiah and Priya (2008) found that dividend policy affects the value of stockholders in organic chemical industry while those in inorganic chemical industry are not affected by dividend policy.

Similarly, Khan (2009) studied the influence of cash dividends and reserved earnings influence on market value of companies registered on the Dhaka Stock Exchange (DSE) for the period 2000 to 2006. The study revealed that both cash dividends and reserved profits have direct and significant association with the market price of the firm. However, reserved profit has lesser influence on stock market price as compared to cash dividend.

In 2010, Salih analysed the correlation between dividend policy and the firm market price. Salih (2010) found that dividend policy has positive and significant association on the market value of the firm. A study by Joshi (2011) examined how dividend policy relates to stock prices in Nepal. Current market price of stock was the dependent variable while dividend of a stock, retained earning of a stock, previous price earnings ratio, and previous market price of a stock were the exploratory variables for the study. He found that both dividend of a common stock and retained earning per stock influence stock market prices of banking and non-banking sectors. It was additionally discovered from his study that dividend of a stock has dominant influence on stock market prices compared to retained profit.

Gul, Sajid, Razzaq, Iqba, and Khan (2012) investigated the correlation between dividend decision and stockholders value in Pakistan. Gul, et al. used secondary data on 75 companies listed on Pakistan and Karachi Stock Exchange during the period 2005 to 2010 for the analysis. Market price per stock is the proxy for measuring stockholders value, while dividend of a stock measures dividend policy. It was found from the study that dividend policy influences the value of stockholders.

Zakaria, Muhammad, and Zulkifli (2012) examined the effect of dividend decision on stock value variation in construction and material companies in Malaysia. Zakaria et al. (2012) used 183 companies comprising 106 material and 77 construction companies for the period 2005-2010. The dependent variable was stock price volatility; dividend yield, dividend payout ratio, leverage, growth, size, and earnings changes constituted the explanatory variables. It was found that dividend yield has direct influence on stock price fluctuations.

Mohammad (2013) studied the effect of dividend policy on value creation for stockholders in the sugar industry of Pakistan. Out of the 36 listed sugar companies on Karachi Stock Exchange, 33 were selected for the study for the period of 6 years from 2006-2011. Mohammad (2013) found that dividend of a stock, earnings of a stock, previous market price of a stock, and previous price earnings ratio influence market price of a stock. Therefore, dividend policy is said to have impact on stockholders' value creation in the sugar industry of Pakistan.

In Sub-Sahara Africa scores of studies have been conducted on dividend policy. In 2007, Amidu studied the relationship between dividend policy and the performance of firms listed on the GSE using ordinary least square. Amidu (2007) found that dividend policy has positive and significant association with performance of firms. The findings suggest that the profitability of the firm is influenced when there is a policy in place to pay dividend by firms listed on the GSE. In a related study, Agyei and Marfo-Yiadom (2011) examined the influence of dividend policy on the performance of commercial banks in Ghana. Panel analysis was employed on the data for the period 1999-2003. The results revealed that banks paying dividend performed better than those not paying dividend.

In a study of Uwuigbe1 et al. (2012), they assessed the determinants of stock prices in Nigeria using regression analysis on thirty (30) listed firms on Nigeria Stock Exchange (NSE). They found that there is a significant positive relationship between firms' dividend payment and the stock market price.

AITroundi and Milhem (2013) investigated the linkage between cash dividends, reserved profits, and stock market values of companies enlisted on the Amman Stock Exchange. They discovered from their study that cash dividend as well as reserved profits impact the stock market values of firms on the Amman Stock Exchange (ASE). The outcome of this study supports previous studies such as Nishat (1992), Pradhan (2003), and Khan (2009). AITroudi and Mihem (2013) further found that the coefficient of dividend of a stock is greater than that of reserved profit of a stock, meaning that stockholders of firms on ASE prefer cash dividend to retained earnings.

In 2005, Uddin and Chowdhury studieded the linkage between dividend payment and stock market price of firms registered on the Dhaka Stock Exchange (DSE). They reported that dividend does not improve stock market price, the stock market price rather reduces around 20% when it is thirty days to the declaration of dividend to thirty days after declaration of dividend. Their outcomes supported the irrelevant dividend hypothesis.

Adefila, Oladapo, and Adeoti (2013) studied the relationship between dividend payment and stock market price of firm in Nigeria. They found that there is no correlation between dividend payment and stock price of firms listed on the Nigeria Stock Exchange. According to them, stock prices are regulated by the Security and Exchange Commission, although Nigerian listed firms do have a dividend policy which depends on earnings, the trend is inconsistent and not proportionate.

Based on the discussion above, it is obvious that studies on the effect of dividend policy on wealth of stockholders have been inconclusive. On the one hand some researchers (Amidu, 2007; Khan, 2009; Salih, 2010; Gul et al., 2012; Oyinlola, & Ajeugbe, 2014) found significant and positive relationship between dividend policy and the market price of firms (wealth of stockholders). Others studies have also reported that dividend policy has no impact on the wealth of stockholders (Uddin & Chowdhury, 2005; Adefila et al., 2013).

3. Method, Data and Variable Description

3.1 Method

To investigate the effect of dividend policy on the wealth of stockholders of companies registered on the Ghana Stock Exchange, this paper used panel data analysis for the period 2005-2011. According to Gujarati (2003) panel analysis combines time series with cross sectional data which can enhance the quality and quantity of data in a way that would be impossible using only one of these dimensions.

The basic model for panel regression has the form:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \dots \beta_k X_{kit} + \varepsilon_{it} \tag{1}$$

Specifically, we specify the model as:

$$MPS_{it} = \beta_0 + \beta_1 DPS_{it} + \beta_2 REPS_{it} + \beta_3 FLEV_{it} + \beta_4 PER_{it} + \varepsilon_{it} \tag{2}$$

Where, MPS is market price per stock, DPS is dividend per stock, REPS is retained earning per stock, FLEV is financial Leverage, PER is price earnings ratio, β_1-β_4 are coefficients, β_0 is the intercept, and ε_{it} is the error term. The subscript *'it'* indicates the firm and time effect.

There are many types of panel data models (Gujarati, 2003; Johnson, 1994; Yaffee, 2005). But for the purpose of this paper we estimated the pooled, random effect, and the fixed effect models.

3.2 Data

Secondary data are used for analysis and comprises annual reports of twenty-five (25) companies out of the thirty-five (35) companies listed on the Ghana Stock Exchange for the period 2005-2011. The data were collected from income statements, statement of financial position, cash flow statements, and the notes to the various accounts for in-depth explanation. The selection of 25 companies was based on two factors: First, the company has paid dividend at least once a year during the study period and second data on the firm are available.

3.3 Variable Description

This section deals with the description of variables (dependent and independent) used in this study.

The dependent variable is the wealth of stockholders and the market price of a stock (MPS) was used as proxy for measuring the dependent variable. Previous studies have also used MPS as measurement of the wealth of stockholders (Khan, 2009; Salih, 2010; Mohammad, 2013; Onyilola & Ajeigbe, 2014). The MPS is the end of fiscal year market price of a common stock. At any point in time investors estimate the price (value) of a stock based on the anticipations of future performance. When the future expectations are favourable, price of the stock will appreciate and the price will fall when expectations of the future performance are unfavourable.

The independent variables include dividend per stock, retained earning per stock, financial leverage, and price earning ratio. Dividend per stock (DPS) and retained earning per stock (REPS) are used to measure dividend policy.

Dividend per stock (DPS) is the amount paid as dividend on an ordinary stock. It is usually proposed by management at annual general meeting for approval by the ordinary stockholders. In this paper dividend per stock is obtained by dividing cash dividends paid to common stockholders by the number of equity stocks issued by the company. Dividend per stock (DPS) is expected to have direct relationship with market price of common stock. Dividend represents a motivation for investing in a particular stock, mainly when the return on that particular security is larger than those obtainable from other alternative form of investments. It is hypothesized that investors will pay a high price for issued dividend-paying stocks and vice versa. Khan (2009), Joshi (2011), and AITroudi & Mihem (2013) have also used DPS as explanatory variable in their studies.

Retained earning per stock (REPS) is the proportion of earning per stock attributable to equity stockholders held in the business for reinvestment. REPS is measured by subtracting dividend per stock from earning per stock. REPS is expected to be positively correlated with market price of common stock (MPS). This is because retained earning is meant to be reinvested in profitable project that will yield more returns, a high retained earning per stock will increase the market price of stock, and low retained earning per stock will decrease the market price of common stock. Salih (2010), Mohammad (2013), and Onyilola and Ajeigbe (2014) have also used REPS as an explanatory variable.

Financial leverage (FLEV) measures how much of the assets of the firm are funded by debt. It is measured by dividing total debt by total assets for each accounting year. Amidu (2007) and, AITroudi and Mihem (2013) have also used financial leverage as explanatory variable. We hypothesize that increase in financial leverage will bring about decline in market price of stocks.

Price earning ratio (PER) measures the confidence that the market has in the firm to earn more income in future considering its present earnings. Mohammad (2013) also used price earning ratio as explanatory variable. It is obtained by dividing market price of common stock (MPS) by earning per stock (EPS) of common stock. Price earning ratio is expected to have direct correlation with market price of ordinary shares.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics and the figures indicate that mean market price of stocks of the selected companies is 1.0744 and the standard deviation is 1.71504. These figures suggest that the average market price of stock is high, and there is high variation in terms of market price of a stock among companies listed on the GSE over the seven-year period of study.

Table 1. Descriptive statistics

Variable	Number of Obs.	Minimum	Maximum	Mean	Std. Deviation
MPS	174	0.02	10.57	1.0744	1.7150
DPS	174	0.00	0.71	0.0516	0.1142
REPS	174	-0.31	1.38	0.0867	0.2174
FLEV	174	0.01	1.23	0.6320	0.2598
PER	174	-121.74	141.56	12.7618	24.3488
Valid N (listwise)	174				

For dividend per stock (DPS) the values are within the range of 0.00 to 0.71; that is, some companies did not pay dividend at all, while other companies paid moderate amount of dividend. Retained earning of a stock (REPS) has a minimum value of -0.31 and the highest value of 1.38. This suggests that some companies suffered losses and did not retain income at all while others retained greater portion of their earnings. It has a mean value of 0.0867, indicating that on the average REPS is low and the standard deviation is 0.2175, indicating high variation.

Price earning ratio (PER) has a minimum value of -121.74 and maximum value of 141.56. The -121.74 figure suggests that stockholders of some companies listed on the Ghana Stock Exchange have lost confidence in the future performance of the companies looking at their present earnings, whilst the 141.56 implying that stockholders of those companies have great confidence in the future performance of the companies based on their current earnings. The average price earning ratio of selected companies is 12.7618 which is very encouraging.

4.2 Multi-Collinearity Test

Tolerance (TOL) and variance inflation factor (VIF) were used to test for multi-collinearity and the results are shown in Table 2.

Table 2. Collinearity statistics

Variable	Tolerance	Variance Inflation Factor
DPS	0.9983	1.00
REPS	0.9780	1.03
FLEV	0.9839	1.02
PER	0.9841	1.02

Table 2 reveals that the TOL levels for the regressors range from 0.9780 to 0.9983, which are above 0 and close to 1. Therefore, from the TOL test, there is no multi-collinearity in the regression model. Additionally, VIF for the independent variables range from 1.00 to 1.03 which are less than five (5) recommended by Berenson et al. (2009), therefore from the VIF test, multi-collinearity poses no serious concern with the set of explanatory variables within the regression model.

The results suggest that the variables of interest (dividend per stock and retained profit per stock) and the control variables are good predictors of market price of stocks of companies enlisted on Ghana Stock Exchange.

4.3 Hausman Test

The Hausman test (1978) was used to choose between fixed effect and random effect models. The results are shown in Table 3.

Table 3. Results of Hausman test

Test Summary	Chi-sq Statistic	Prob.
Hausman	21.66	0.0002

From Table 3 the estimated Probability value is 0.0002. This figure is below 0.05 and thus suggests that the fixed effect model is a better choice. The import of this result is that there are both individual firm effect and time effect in the determination of stocks market prices.

4.4 Analysis of Regression Results

Tables 4, 5, and 6 reports the regression results for the three panel models (Fixed, Random, and pooled Effects). Results for all the models are roughly similar but following the Hausman test results, the analysis is based on the fixed effect report. Results for the fixed effect model indicate that the adjusted R-squared value is 0.6160, thus suggesting that the explanatory variables explain roughly 61% of changes in the dependent variable - market price of stocks (MPS).

Table 4. Fixed effect regression results - dependent variable is MPS (174 Obs.)

Variable	Coef.	Std. Err.	Prob.
DPS	5.883	1.168	0.000
REPS	1.082	0.492	0.029
FLEV	-0.226	0.404	0.576
PER	0.005	0.003	0.080
_CON	0.758	0.276	0.077
R-Squared:	0.8162	Adjusted R-Squared:	0.6160

Table 5. Random effect regression results - dependent variable is MPS (174 Obs.)

Variable	Coef.	Std. Err.	Prob.
DPS	8.987	0.987	0.000
REPS	1.263	0.434	0.004
FLEV	-0.484	0.358	0.176
PER	0.005	0.003	0.070
_CON	0.739	0.273	0.007
R-Squared:	0.8252	Adjusted R-Squared:	0.6239

Table 6. Pooled effect regression results - dependent variable is MPS (174 Obs.)

Variable	Coef.	Std. Err.	Prob.
DPS	11.253	0.708	0.000
REPS	1.561	0.377	0.000
FLEV	-0.842	0.313	0.080
PER	0.007	0.003	0.040
_CON	0.803	0.221	0.000
R-Squared:	0.6252	Adjusted R-Squared:	0.6163

From the regression results all the explanatory variables have the expected signs. DPS and REPS are statistically significant at the 1% and 5% significance levels respectively. The coefficient for PER is also significant but the significance level looks weak i.e. 10%.

The report shows that the DPS variable is consistent with standard findings and suggests that there is positive coefficient (5.883) and statistically significant (0.000) association between dividend per stock and market price of a stock at 1% level of significance. This finding suggests that the variable of interest, dividend per stock does influence the market price of the stock of companies registered on the GSE. This finding is consistent with some past studies (Khan, 2009; Salih, 2010; Joshi, 2011; Mohammad, 2013). These studies reported positive and significant association between dividend per stock and the market price of a stock. In contrast, our finding does not appear to support Adaramola (2012) and Adefila et al. (2013).

As regards retained earning per stock (REPS) Table 4 indicates that it has a positive and significant impact on market price of stock (MPS) at 5% level of significant. This suggests that retained earning per stock and the market price of stock are positively correlated. This finding is in line with Khan (2009), Salih (2010), Joshi (2011), AITroundi and Milhem (2013). These studies found that retained earning per stock has positive and significant relationship with the market price of stock.

Additionally, results in Table 4 reveal that the PER coefficient is positive (0.00481) and statistically significant. However, as indicated earlier the significant level is weak-i.e. 10%. This weak significance level notwithstanding our finding shows that price earning ratio has positive influence on market price of stock. Our finding buttresses Mohammad (2013) who showed that price earning ratio has positive but insignificant relationship with the market price of a stock.

On financial leverage (FLEV) the results reveal that it has negative but statistically insignificant association with market price per stock (MPS). This finding is inconsistent with previous study. For example AITroundi and Milhem (2013) found that financial leverage has positive but statistically insignificant relationship with the market price of a stock.

5. Conclusion and Policy Implication

The major objective of the research was to examine the impact of dividend policy on the wealth of stockholders of companies enlisted on the Ghana Stock Exchange. Secondary data obtained from the annual reports of twenty five companies registered on the GSE were used. Fixed-effect model was applied to data covering the period 2005-2011. Market price per stock was used as proxy for measuring the wealth of stockholders. Dividend per stock and retained earning per stock measured dividend policy. The paper also used financial leverage and price earning ratio as control variables.

Our regression results in Table 4 show that there is positive and significant association between dividend payments and stock market price of companies enlisted on the Stock Exchange of Ghana. Another significant finding is that retained earnings and price earnings ratio are positively correlated with stock market price of companies. The result also reveal that dividend per stock has greater significant positive impact on the stock market price of companies listed on GSE compared to retained earning per stock.

Indeed, our findings have significant policy implications for Ghana and Sub-Sahara Africa in general. Firms listed on the Ghana Stock Exchange should adopt optimal trade-off policy between dividend payments and retained earnings that would improve stockholders wealth in terms of dividend payment and capital appreciation.

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Modeling and Analyzing the Mean and Volatility Relationship between Electricity Price Returns and Fuel Market Returns

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Abstract

This paper has two objectives. First, we apply the symmetric and asymmetric VAR(1)-BEKK-MGARCH(1.1), VAR(1)-CCC-MGARCH(1,1), VAR(1)-DCC-MGARCH, VAR(1)-VARMA-CCC-MGARCH and VAR(1)-VARMA-DCC-MGARCH models to explore the return and volatility interactions among electricity and other fuel price markets(oil, natural gas, and coal). Second, this paper investigates the importance of not only volatility spillover among energy markets, but also the asymmetric effects of negative and positive shockson the conditional variance of modeling one energy market's volatility upon the returns of future prices within and across other energy markets. The empirical results display that these models do capture the dynamic structure of the return interactions and volatility spillovers and exhibit statistical significance for own past mean and volatility short-and long-run persistence effects, while there are just a few cross-market effects for each model.

Keywords: return and volatility spillover, electricity market, fuel market, energy market, MGARCH

1. Introduction

The uncertain context that currently affects the world economy and the energy sector, as well as the unstable political situation of some countries that are the most important producers of raw materials (for example, oil, natural gas, coal, and electricity), makes it even more necessary to develop quantitative tools and models that help to improve investment decisions and to adequately deal with such increasing uncertainty. The risks to the energy sector are mainly linked with the high volatility of natural gas, coal, oil, and electricity prices, which evolve over time and aredifficult to model. Electricity is traded nowdays in competitive markets, as occurs with other commodities, but it presents some characteristics that make it quite different, such as it cannot be stored, or cannot be used for just a small amount, or demand needs to be covered immediately. These peculiar features are responsible for its highly volatilite behavior and the difficulty in its price forecasting. Other energy prices (such as oil, coal, and gas) are also very volatilite and difficult to forecast and model, yet they influence electricity prices as well.

Natural gas iswidely considered as a timely alternative source to oil, as stated by Munoz and Dickey (2009) in which natural gas is the main component of electricity generation and of electricity price. The inputs to electricity generation, such as oil and natural gas price changes, are directly or indirectly reflected in electricity price changes. These fuel prices may also affect electricity prices to the extent that they serve as substitutes on the demand side of the energy market. Mohanmadi (2009) stated that under market-based pricing, electricity prices should partly reflect fuel costs at least in the long run, but under cost-based pricing, they should reflect a mark-up over average or marginal costs.

The relationship between electricity prices and fuel costs has been extensively studied in the previous literatures. For example, Emery and Liu (2002) analyzed the relationship between electricity and natural gas future prices on the New York Mercantile Exchange (NYMEX), California Oregon Border (COB), and Palo Verde (PU) and found that the two futures prices are cointegrated. Mjelde and Bessler (2009) examined the relationships among electricity prices and coal, natural gas, crude oil, and uranium prices. Empirical results show that peak electricity prices react to shocks in natural gas prices. Serletis and Shahmoradi (2006) investigated the causal relationships between natural gas and electricity price (and volatility) changes, with results indicatingbi-directional (linear and non-linear) causality between them. Mohammadi (2009) looked at the long-run and short-run dynamic relations among electricity prices and coal, natural gas, and crude oil prices in the U.S. marketfrom 1960 to 2007. He found significant long-run relationship between electricity and coal prices and uni-directional short-run causality relation from coal and natural gas prices to electricity prices.Furio and Chulia (2012) used VECM and MGARCH methods to study the causal relationship between Spain's electricity, oil, and natural gas prices. They found that oil and natural gas forward prices play a important role in electricity prices. Moreover, causation, both in price and volatility, runs from oil and natural gas forward markets to electricity forward markets at Spain.

The important characteristic of electricity is that it cannot be stored at any significant scale. The lack of inventories together with the fact that power generation and consumption need to be coincident with each other means prices react quickly to supply and / or demand disruptions. As a consequence, spot prices for electricity are highly volatile. According to this context, forward markets play a major role to the extent they provide a tool for participants to manage the risk derived from the volatility of spot prices. Thereby, hedging helps prevent financial difficulties following adverse price movements, which can have a positive effect on the financial stability of utilities for traders that use forward markets to protect their spot positions. Another important function of forward markets lies in price discovery.Electricity spot prices cannot be used to make meaningful predictions about movements in the forward price. Instead, a more fitting theory for electricity markets is provided by the Unbiased Expectation Hypothesis, which mainly states that forward prices are unbiased predictors of future spot prices, specifically for these that will be observed during the maturity periods of the forward contracts.

Explicitly modeling the volatility process of electricity prices for daily or higher frequencies has also gained much attention by researchers, bringing about a growing field in the recent empirical literature. Autoregressive integrated moving average (ARIMA) models with autoregressive conditional heteroskedastic (ARCH) (Engle, 1982) or generalized autoregressive conditional heteroskedastic (GARCH) (Bollerslev, 1986) processes are the more widely used approaches for modeling the mean and volatility of electricity prices. The success of the GARCH model has subsequently led to a family of univariate and multivariate GARCH models that capture different behaviors of price returns, including time-varying volatility, persistence and clustering of volatility, and the asymmetric effects of positive and negative shocks of equal magnitude. Substantial research has been conducted on spillover effects in energy future markets. Lin and Tamvakis (2001) investigated volatility spillover effects between the New York Mercantile Exchange (NYMEX) and International Petroleum Exchange (IPE), with crude oil empirical results exhibitinga substantial spillover effect. Ewing et al. (2002) investigated the transmission of volatility between oil and natural gas markets using daily return data and found that changes in volatility in one market may have spillovers to the other market. Chang et al. (2009) looked at multivariate conditional volatility and conditional correlation models of the spot, forward, and future price returnsof three crude oil markets (Brent, WTI, and Dubai) and provided evidence of significant volatility spillovers andasymmetric effects in the conditional volatilities across returns for each market.Guesmi and Fattoum (2014) used DCC-AGARCH models to estimate dynamic conditional correlations between oil importing countries and oil exporting countries. They found that cross-market co-movement, as measured by conditional correlation coefficients, increases positively in response to significant aggregate demand.

Linza et al. (2006) applied the constant conditional correlation (CCC) model of Bollerslev (1990) and the DCC model of Engle (2002) for West Texas Intermediate (WTI) oil forward and future returns.Manera et al.(2006) employed the CCC and the Vector Autoregressive Moving(VARMA-GARCH) models of Ling and McAleer (2003), the VARMA-Asymmetric GARCH (VARMA-AGARCH) model of McAleer et al. (2009), and the DCC model upon spot and forward returns in the Tapis crude oilmarket.Da Veiga et al. (2008) analyzed the multivariate Vector ARMA-GARCH (VARMA-GARCH) model of Ling and McAleer (2003) and the VARMA-AGARCH model of McAleer et al. (2009) and found that they are superior to the GARCH model of Bollerslev (1986) and the GJR model of Glosten et al. (1992).

There are two objectives of this paper. First, we apply the VAR(1)-BEKK-MGARCH(1,1), VAR(1)-CCC-MGARCH(1,1), VAR(1)-DCC-MGARCH(1.1), VAR(1)-VARMA-CCC-MGARCH(1.1) and VAR(1)-VARMA-DCC-MGARCH(1.1) models to analyze the return and volatility interactions among electricity and other fuel price markets (oil, natural gas, and coal). These models cansimultaneously estimate returns and volatility cross-effects for the fuel price markets under consideration. The MGARCH approach further explains the origins, directions, and transmission intensity of the shocks between markets. All these models can capture the effects on the current conditional volatility of own innovations and lagged volatility as well as the cross-market shocks and the volatility transmission of other markets. As shown by Gallaghar and Twomey (1998), modeling price volatility spillover provides better insight into the dynamic price relationship between markets, but inferences about any inter-relationship depend importantly on how we model the cross dynamics in the conditional volatilities of the markets. Second, this paper investigates the importance of not only volatility spillover among energy markets, but also the asymmetric effects of negative and positive shocks of equal magnitude on the conditional variance of modeling one energy market's volatility upon the returns of future prices within and across other energy markets. We do this by using the VAR(1)-BEKK-AMGARCH(1.1), VAR(1)-CCC-AMGARCH(1.1), VAR(1)-DCC-AMGARCH(1.1), VARMA-CCC-AMGARCH(1.1), and VARMA-DCC-AMGARCH(1.1) models.

The structure of the remainder of this paper is organized as follows. Section 2 discusses the multivariate GARCH model to be estimated. Section 3 describes the data and some preliminary analysis. Section 4 analyzes the empirical estimates from the empirical model. Concluding remarks are given in Section 5.

2. Econometric Models

The objective of this study is to investigate the price returns and volatility spillovers between electricity and fuel price markets. First proposed by Bollerslev et al. (1988), the MGARCH models are becoming standard in finance and energy economics. Combined with a Vector Autoregressive model for the mean equation, theyallow for rich dynamics in the variance-covariance structure of the series, making it possible to model spillovers in both the values and conditional variances of series under this study.

This section presents the BEKK model of Engle and Kroner (1995), the CCC model of Bollerslev (1990), the VARMA-AGARCH model of McAleer et al. (2009), and the VARMA-GARCH model of Ling and McAleer (2003). These models assume constant conditional correlations and do not suffer from the problem of dimensionality, as compared with the VECH model (McAleer et al., 2008; Caporin & McAleer, 2009; Chang et al., 2013). The BEKK model is a more general specification, while the DCC model of Engle (2002) is less computationally demanding and enables time-varying correlation among series with only two additional parameters (Efimova, 2014).

MGARCH is a valuable approach, because volatility spillovers are expected among coal, oil, natural gas, and electricity markets. Not only are they substitutes in consumption, but coal, natural gas, and oil are also used as inputs in electricity generation, and oil, natural gas, and coal are complements in production. The chosen specification allows us to model the transmission of price volatility transmission from one energy market to the others and to estimate the effects of volatility in any of the four energy markets on the price of each energy market.

The VARMA method to modeling the conditional variances allows large shocks to one variable to affect the variance of other variables. It is a convenient specification that allows for volatility spillovers. This specification assumes symmetry in that positive shocks and negative shocks of equal magnitude have the same impact on conditional volatility. McAleer et al. (2009) extended the VARMA-GARCH model to include asymmetric GARCH effects, and this is referred to as the VARMA-AGARCH model.

2.1 VAR(1) Conditional Mean Model

For the empirical analysis of energy price mean return spillovers, this paper assumes that the conditional mean of price returns on the electricity and fuel markets can be described as a Vector Autoregressive (VAR) model. Under the four-variable model, we describe the VAR(1) model as:

$$r_e = \alpha_e + \beta_{e0} r_{e,t-1} + \beta_{e1} r_{o,t-1} + \beta_{e2} r'_{s,t-1} + \beta_{e3} r_{e,t-1} + \varepsilon_{et} \quad (1)$$

$$r_o = \alpha_o + \beta_{o0} r_{e,t-1} + \beta_{o1} r_{o,t-1} + \beta_{o2} r'_{s,t-1} + \beta_{o3} r_{e,t-1} + \varepsilon_{ot} \quad (2)$$

$$r_s = \alpha_s + \beta_{s0} r_{e,t-1} + \beta_{s1} r_{o,t-1} + \beta_{s2} r'_{s,t-1} + \beta_{s3} r_{e,t-1} + \varepsilon_{st} \quad (3)$$

$$r_c = \alpha_c + \beta_{c0} r_{e,t-1} + \beta_{c1} r_{o,t-1} + \beta_{c2} r'_{s,t-1} + \beta_{c3} r_{e,t-1} + \varepsilon_{ct} \quad (4)$$

Here, r_e, r_o, r_s, and r_c are the logarithmic returns of the electricity, oil, natural gas, and coal price return series, respectively. The residuals ε_{et}, ε_{ot}, ε_{st}, and ε_{ct} are assumed to be serially uncorelated, but the covariance does not need to be zero. Here, the parameter coefficients (β_{e0}, β_{o1}, β_{s2}, and β_{c3}) provide the measure of own mean price return spillovers. However, the rest of the parameter coefficients measure the cross-mean spillover between electricity prices and fuel energy markets.

2.2 MGARCH Conditional Volatility Spillover Models

This section presents the BEKK model of Engle and Kroner (1995), the CCC model of Bollerslev (1990), the DCC model of Engle (2002), the VARMA-GARCH model of Ling and McAleer (2003), and the VARMA-AGARCH model of McAleer et al. (2009). This paper employs the MGARCH approach to examine the price returns of inter-dependence and dynamic volatility spillover between electricity, oil, natural gas, and coal markets.

The first model contains a variance equation, which is the dynamic conditional model of BEKK introduced by Engle and Kroner (1995). The BEKK model of MAGRCH(1.1) is given as:

$$H_t = C'C + A'H_{t-1}A + B'\eta_{t-1}\eta'_{t-1}B \quad (5)$$

Here, $C'C, B'B$, and $A'A$ are *4X4* matrices with C being a triangular matrix to ensure positive definiteness of H_t. This specification allows positive volatilities H_{t-1}, as well as lagged values of $\eta_t \eta'_t$, to show up in estimating the current energy price volatilities. We assume matrix H_t is symmetric. Thus, the model provides eight unique equations modeling the dynamic variances of electricity, oil, gas, and coal prices, as well as the covariance between them.

According to this diagonal representation, the conditional variances are functions of their own lagged values and own lagged square return shocks, while the conditional covariances are functions of the lagged covariance and lagged cross-products of the corresponding returns shocks. The estimations of the BEKK models are carried out by the quasi-maximum likelihood (QML), where the conditional distribution of error term is assumed to follow a joint Gaussian log-likelihood function of a sample of T observations and $K = 4$ as follows:

$$log\, L = -\frac{1}{2}\sum_{t=1}^{T}[k\, log(2\pi) + ln|H_t| + \eta_{t-1} H_t^{-1}\eta_t] \quad (6)$$

We present the CCC model of Bollerslev (1990) as:

$$R_{t=}E(R_t|\Psi_{t-1}) + \mathcal{E}_t, \mathcal{E}_t = D_t Q_t, Var(\mathcal{E}_t|\Psi_{t-1}) = D_t \Gamma D_t \quad (7)$$

Here, we denote R_t=(R_{1t}...R_{mt})', Q_t=(Q_{1t}....Q_{mt})'as a series of independently and identically distributed random vectors. These return series decompose R into its predictable conditional mean and random component, where Ψ_t is the past information available at time *t*, D_t=*diag*($h_t^{\frac{1}{2}}$...$h_{mt}^{\frac{1}{2}}$), and m is the number of returns. As$\Gamma = E(D_t D'_t|\Psi_{t-1}) = E(D_t D_{t'})$, where$\Gamma = e_{ij} = e_{ji}$ for$i$,*j*=*1*...*m*, the constant conditional correlation matrix of the unconditional shocks, Q_t, is equal to the constant conditional covariance matrix of the conditional shocks, $\mathcal{E}_t$. The conditional covariance matrix is positive definite if and only if all the conditional variances are positive and Γ is positive definite. Here, Γ is equal to $D_t^{-1}\Omega D_t^{-1}$, which is assumed constant over time, and each conditional correlation coefficient is estimated from the standard residual of $\mathcal{E}_t$ (Chang et al., 2013).

The CCC model of Bollerslev (1990) assumes that the conditional variance of price returns, H_{it}, $i = 1 \ldots . m$, follows a univariate GARCH process defined as:

$$H_{it} = Z_i + \sum_{i=1}^{r} A_{ij} \sum_{i,t-j}^{2} + \sum_{j=1}^{3} B_{ij}\, h_{i,t-j} \quad (8)$$

Here, A_{ij} represents the ARCH effect and the short-run persistence of shocks to return$i$. However, B_{ij} shows the GARCH effect, and A_{ij} plus B_{ij} denotes the long-run persistence of shocks to returns. In the DCC model, which assumes a time-dependent conditional correlation matrix $R_t = (e_{ij,t})$, $i, j = 1 \ldots .4$, the conditional variance-covariance matrix Ht is defined as:

$$H_t = D_t R_t D_t \quad (9)$$

Here, $D_t = diag\{\sqrt{hit}\}$ is a *4x4* diagonal matrix of time-varying standard deviations from univariate GARCH models, and $R_t = \{eij\}_t$, i, j=1…4, which is a correlation matrix containing conditional correlation coefficients.

We define H_{it} as a GARCH(1,1) specification as follows:

$$h_{it} = w_i + \sum_{j=1}^{n} \alpha_{it} \sum_{ij-n}^{2} + \sum_{t=1}^{k} B_{il}\, h_{it-l} \text{and } R_t = diag\left(\sqrt{q_{ij,t}}\right) Q_t\, diag\left(\sqrt{q_{ij,t}}\right) \quad (10)$$

We now give the 4x4 symmetric positive definite matrix $Q_t = (q_{ij})_{t,i,j} = 1 \ldots 4$ by:

$$Q_t = (1-\alpha-\beta)\bar{Q} + \alpha\mathcal{E}_{t-1}\mathcal{E}'_{t-1} + \beta Q_{t-1} \tag{11}$$

Here, Q_t is the 4x4 conditional covariance matrix $\overline{Q}$ obtained from the first stage of estimation and Q_t^* is a diagonal matrix containing the square root of the diagonal elements of Q_t. The DCC-MGARCH process is estimated by using the maximum likelihood method in which the log-likelihood can be expressed as:

$$L = \frac{-1}{2}\sum_{t=1}^{T}(n\, log(2\pi) + 2\, log|D_t| + log|R_t| + \mathcal{E}'_t R_t^{-1}\mathcal{E}_t) \tag{12}$$

The estimation of DCC is broken into two stages, simplifying the estimation of a time-varying correlation matrix. In the first stage, univariate volatility parameters are estimated using GARCH models for each of the variables. In the second stage, the standardized residuals from the first stage are used as inputs to estimate a time-varying correlation matrix. The DCC model allows asymmetry, meaning that the weights are different for positive and negative changes to a series. The asymmetries are in variances, not in correlations (Cappielo et al., 2003).

This study also utilizes the DCC model form of the MEGARCH model to analyze the electricity market and fuel market interdependence and also the volatility transmission between electricity, gas, oil, and coal markets. The asymmetric GARCH model captures the asymmetric volatility spillovers and assumes that the correlations between shocks will be constant over time. Here, this study allows these correlations to be time-varying. Following Sarva et al. (2005), this paper sets up the VAR(1)-DCC-MGARCH(1,1) model as:

$$R_{it} = \beta_{io} + \sum_{j=1}^{n}\beta_{ij}\, R_{j,t-1} + U_{it} \tag{13}$$

$$\sigma_{i.t}^2 = exp\left[\alpha_{io} + \sum_{j=1}^{n}\alpha_{ij}\, f_j\left(Z_{j,t-1}\right) + \delta_i\, ln\left(\sigma_{i,t-1}^2\right)\right] \tag{14}$$

$$f_j\left(Z_{j,t-1}\right) = \left(\left|Z_{j,t-1}\right| - E\left(\left|Z_{j,t-1}\right|\right) + r_j Z_{j,t-1}\right) \tag{15}$$

According to the mean equation, the dynamic return relationships among the energy markets are captured by using a VAR(1) model, E$[R_t|U_{t-1}]$, where U_{t-1} is the past information available at time $t-1$. Here, Rit is a function of own past returns and the cross-market price return, $R_{j,t-1}$. The parameter coefficient of B_{ij} captures the return spillover relationships in different price markets, for $i \neq j$. The conditional variance in each market is an exponential function of past standardized innovations $(Z_{j,t-1} = \varepsilon_{j,t-1}|b_{j,t-1})$. Persistence in volatility is measured by δ_i. Suppose that $\delta_i = 1$, and then the unconditional variance does not exist and the conditional variance follows an I(1) process. The coefficients of α_{ij} measure the spillover effects, while $\mathrm{r}_j < 0$ implies asymmetry. The asymmetric influence of innovation on the conditional variance is captured by the term $(\sum_{j=1}^{n}\alpha_{ij}\, f_j(Z_{j,t-1}))$. Here, a significant positive i_j together with a negative(positive) r_j shows that negative shocks in market j have a greater impact on the volatility of market i than positive(negative) shocks. The ratio of $|\text{-}1+\mathrm{r}_j|/|(1+\mathrm{r}_j)|$ measures the relative importance of the asymmetric (or leverage) effect.

The notations $(|Z_{j,t}|\text{-}E(|Z_{j,t-1}|)$ measure the size effects, which show that a positive α_{ij} implies that the impact of $\mathrm{Z}_{j,t}$ on X,$\sigma_{i,t}^2$ will be positive(negative) if the magnitude of $\mathrm{Z}_{j,t}$ is greater than its expected value $E(|Z_{j,t}|)$. The distrubance error term of the mean equation is assumed to be conditionally multivariate normal with zero mean, and conditional covariance matrix Ht is given as:

$$\varepsilon_t|\Psi_{t-1} \sim N(0,H_t), H_t = D_t S_t D_{t,}\sigma_{ij,t} = q_{ij,t}\sigma_{i,t}\sigma_{jt} \tag{16}$$

In the above equation, D_t is a nxn diagonal matrix with the time-varying standard deviations of equation on the diagonal and S_t is a time-varying symmetric correlation matrix as:

$$\mathrm{D_t} = \begin{bmatrix} \sigma_{1,t} & 0 \dots & 0 \\ 0 & \mathrm{b_{2,t}} & 0 \\ \vdots & \ddots & \vdots \\ 0 & 0 & \mathrm{b_{n,t}} \end{bmatrix} \mathrm{S_t} = \begin{bmatrix} \mathrm{S_{1,1,t}} & \mathrm{S_{1,2,t}} \dots & \mathrm{S_{1,n,t}} \\ \mathrm{S_{2,1,t}} & \mathrm{S_{2,2,t}} & \mathrm{S_{2,n,t}} \\ \vdots & \vdots & \vdots \\ \mathrm{S_{n,1,t}} & \mathrm{S_{n,2,t}} & \mathrm{S_{n,n,t}} \end{bmatrix} \tag{17}$$

The DCC model is a specification of the dynamic correlation matrix S_t. The dynamic correlations are captured in this model by the asymmetric general diagonal DCC equation:

$$Q_t = \left(\overline{Q} - A'^{\overline{Q}}A - B'^{\overline{Q}}B - C'^{\overline{N}}C\right) + A'^{Z_{t-1},Z_{t-1}}A + B'^{Q_{t-1}}B + C'^{\eta_{t-1}\eta_{t'-1}}C \quad (18)$$

Here, $\overline{Q}$ and $\overline{N}$ are the unconditional correlation matrices of Z_t and η_t, with $\eta_{i,t} = I[Z_{i,t<0}]Z_{i,t}$, where $I[Z_{i,t<0}]$ is the indicator function that takes the value unity when $Z_{i,t<0}$ (Engle, 2002; Capiello et al., 2003). The matrices of *A*, *B*, and *C* are restricted to being diagonal for estimation purposes. If $(\overline{Q} - A'\overline{Q}A - B'\overline{Q}B - C'\overline{N}C)$ is positive definite, then Q_t will be positive definite with probability one. Because Q_t does not have unit diagonal elements, then we scale it to get a correlation. Matrices$S_t$are given as $S_t = Q_{t*} - Q_t Q_{t*-1}$. However, the MEGARCH model allows us to test both the volatility spillovers and asymmetries, but it is not useful to apply this model to the conditional correlations, because it would unduly restrict the conditional correlations to be always positive and because it has to many parameters. The DCC model does not have these problems, but does allow for the possibility of asymmetric effects.

The model can be estimated by maximum likelihood, in which the log-likelihood function can be shown as:

$$L(Q) = -\frac{1}{2}\sum_{t=1}^{T}(k\,log(2\pi) + log(|H_t|) + \varepsilon'_t H_t^{-1}\varepsilon_t \quad (19)$$

$$= -\frac{1}{2}\sum_{t=1}^{T}(k\,log(2\pi) + log(|D_t S_t D_t|) + \varepsilon'_t D_t^{-1} S_t^{-1} D_t^{-1}\varepsilon_t) \quad (20)$$

Here, k is the number of equations, T is the number of observation, Q is the parameter vector to be estimated, ε_t is the vector of innovations at time t, andH_t is the time-varying conditional variance-covariance matrix with diagonal elements and cross-diagonal elements. Although Engle (2002) and Cappiello et al. (2003) used the two-step approach, Wong and Vlaar (2003) showed this can lead to a relatively large loss of efficiency. This study employs the VAR(1)-MGARCH model by including the lagged returns from each market in the mean equation in order to capture the price spillover effects from one market to the other markets. Similarly, the variance equation captures the volatility spillover effects and also the asymmetry effects. We utilize the one-step estimation procedure, which is more efficient than the two-step approach.

2.3 MGARCH-Asymmetric Model

This study uses the daily price returns of the energy markets, which are computed as first differences of their natural logarithms. As the goal of this study is to consider the interdependence across the four energy markets, this study use the MGARCH model in the style of the BEKK model proposed by Engle and Kroner (1995). We first consider four-variate sequences of data $\{r_t\}_{t=1}^{n}$ consisting of electricity price changes and the other energy price market returns. The statistical model is given by:

$$\gamma_{i,t} = \alpha_{it} + \beta_{it}\sum_{i=1}^{4}\gamma_{i,t-1} + \varepsilon_{it}, \varepsilon_{it} = \sqrt{H_t}V_t \quad (21)$$

Here, $r_{i,t}$ is the *4X1* vectors of the four daily energy price returns at time t, ε_t is a *4X1* vector of residuals, $V_t$is a *4X1* vector of standardized (*i,i.d*) residuals, and H_t is the *4X4* conditional variance-covariance matrix. The 4X1 vector, α_{it}, represents a constant.

Bollerslev et al. (1988) proposed that H_t is a linear function of the lagged squre errors, the cross products of errors, and the lagged values of elements of H_t as follows:

$$Vech(H_t) = Vech(C) + \sum_{i=1}^{n} A_i\,Vech(\varepsilon_{t-i}\varepsilon'_{t-i}) + \sum_{i=1}^{T} G_i Vech(H_{t-i}) \quad (22)$$

Here, *Vech* is the operator that stacks the lower triangular portion of a symmetric matrix into a vector. The problems with this are that the number of parameters to be estimated is large and the restrictions on the parameters are to ensure that the conditional variance matrix is positive definite. Engle and Kroner (1995) proposed the BEKK model to overcome the above problem as:

$$H_t = G'G + A'^{U'_{t-1}}A + B'^{H_{t-1}}B \tag{23}$$

The BEKK model provides cross-market effects in the variance-covariance equation and guarantees positive semi-definiteness by working with quadratic forms. The conditional variance-covariance matrix is specified according to the asymmetric BEKK model (ABEKK) of Kroner and Ng (1998). The ABEKK model allows the asymmetric response of volatility (i.e., price volatility tends to rise more in response to negative shocks (bad news) than to positive shocks (good news)) in the variance and co-variance:

$$H_t = G'G + A'U'_{t-1}U_{t-1}A + B'H_{t-1}B + D'\rho'_{t-1}\rho D \tag{24}$$

Here, ρ_t is defined as U_t if U_t is negative and zero otherwise. The last part of the right-hand side for H_t captures the asymmetric property of the time-varying variance-covariance. G is a 4X4 lower triangular matrix of constants, while A, B, and D are *4X4* parameter matrices. The diagonal parametric in matrices A and B measures the effects of own past innovations and past volatility of market i on its conditional variance, while the diagonal parameters in matrix D measure the response of market i to its own past negative innovations. The off-diagonal parameters in matrices A and B, measure the cross-market effects of stock and volatility, also known as volatility spillover, while the off-diagonal parameters measure the response of market i to negative shocks, i.e., bad news, from the other markets. This is called the cross-market asymmetric response.

The BEKK models can be estimated efficiently and consistently using the full information maximum likelihood method. The log likelihood function of the joint distribution is the sum of all the log likelihood functions of the conditional distribution. The log likelihood function is given as:

$$L_t = \frac{n}{2}ln(2\pi) - \frac{1}{2}ln|H_t| - \frac{1}{2}u_t H_t^{-1}u_t \tag{25}$$

This study takes the VARMA-GARCH model of Ling and McAleer (2003) and the VARMA-AGARCH model of McAleer et al. (2009) to set up the volatility dynamics and conditional correlations between electricity and fuel energy prices. The VARMA-AGARCH model is an extension of the VARMA-GARCH model of Ling and McAleer (2003) and assumes the symmetry in the effects of positive and negative shocks of equal magnitude on the conditional volatility. The VARMA-GARCH approach to modeling the conditional variance allows large shocks to one variable to affect the variances of the other variables. The VARMA-GARCH(1,1) model used to model the time-varying variances and covariancesis:

$$\mathrm{R}_{it} = \mathrm{E}(\mathrm{R}_{it}|\mathrm{X}_{t-1}) + \mathrm{u}_t \tag{26}$$

$$\emptyset(L)(R_{t-u}) = \Psi(L)u_t \tag{27}$$

$$u_t = D_t\eta_t \tag{28}$$

$$H_t = A_t + \sum_{i=1}^{r} B_i\,\overrightarrow{u_{t-i}} + \sum_{j=1}^{s} C_j\,H_{t-j} \tag{29}$$

Here, R_{it} is the return for variable series i at time t, X_{t-1} is the past information available at time t, $\emptyset_L = l_m - \emptyset_1 l \ldots\ldots - \emptyset PL^P$ and $\Psi(L) = l_m - \Psi_{1L} \ldots\ldots - \Psi_q L^q$ are polynomials in the lag operator, $\mathrm{H}_t = (\mathrm{h}_{1t} \ldots\ldots \mathrm{h}_{mt}), \eta_t = (\eta_{1t} - \eta_{mt})', A_t = (w_{1t} - w_{mt})', \overline{u}_t = (u_{it}^2 - u_{mt}^2)'D_t$ is diag $(\mathrm{h}_t\frac{1}{2})$, m is the returns to be analyzed, $t = 1 \ldots m, B_i$ and C_j are *mxm* matrices, and α_{ij} and β_{ij} for i, j=1…m are mXm matrices and represent the ARCH and GARCH effects, respectively. The spillover effects of the conditional variance between electricity price future returns and fuel energy price future returns are given in conditional volatility for each market in the portfolio. If $m = 1$, then the VARMA-GARCH model reduces to the univariate GARCH model of Bollerslev (1986).

McAleer et al. (2008) proposed the VARMA-AGARCH model to accommodate asymmetric impacts of the positive and negative shocks and to capture asymmetric spillover effects from each of the other returns. The VARMA-AGARCH model specification of the conditional variance is:

$$\mathrm{H}_t = \mathrm{A}_t + \sum_{i=1}^{r} B_i\,u_{t-i} + \sum_{i=1}^{r} D_i\,(I_{t-i})\overrightarrow{u_{t-i}} + \sum_{j=1}^{s} C_j\,H_{t-j} \tag{30}$$

Here, $\mathrm{u}_{it} = \eta\mathrm{h}_{it}^{1/2}$ for all $i$and t, D_i are *mxm* matrices, and $\mathrm{D}_i(\mathrm{I}_{t-i})$ is an indicator variable, such that:

$$\mathrm{I} = \begin{cases} 0, & u_{it}>0 \\ 1, & u_{i,t}\leq 0 \end{cases} \quad (31)$$

If $D_i=0$ for all i, then VARMA-AGARCH reduces to VARMA-GARCH. Furthermore, if $D_i = 0$, with B_i and C_j being diagonal matrices for all i, and j, then VARMA-AGARCH reduces to the CCC model of Bollerslev (1990). The CCC model does not have asymmetric effects of positive and negative shocks on conditional volatility and volatility spillover effects across different financial assets.

The parameters can be estimated by maximum likelihood by using a joint normal density as:

$$\hat{Q} = argmin \frac{1}{2}\sum_{t=1}^{n}(log|Q_t| + u_t^1 Q_t^{-1}u_t) \quad (32)$$

Here, $\hat{Q}$ is the vector of parameters to be estimated by the conditional log-likelihood function. Moreover, $|Q_t|$ is the determinant of Q_t, the conditional covariance matrix, when η_t does not follow a joint multivariate normal distribution. The Quasi-MLE (QMLE) model presents the appropriate estimators (Chang et al., 2010, 2011, 2013).

3. Data and Descriptive Statistics

For our empirical application, the volatility of daily prices is selected, because the MGARCH models are mostly appropriate for daily frequency. The dataset covers 2660 daily observations from March 22, 2004 to May 29, 2014, selected because volatility clustering was highly observed during this period. The variable series under study are the following.

Electricity price, NYMEX, Unit:US$/TE, Code No:NTGCS00.

Crude oil, NYMEX, Unit:US$/BL, Code No:NCLCS00.

Natural Gas, NYMEX, Unit:US$/TE, Code No:NNGCS00.

Coal, NYMEX, Unit:US$/TE, Code No: NOLCS00.

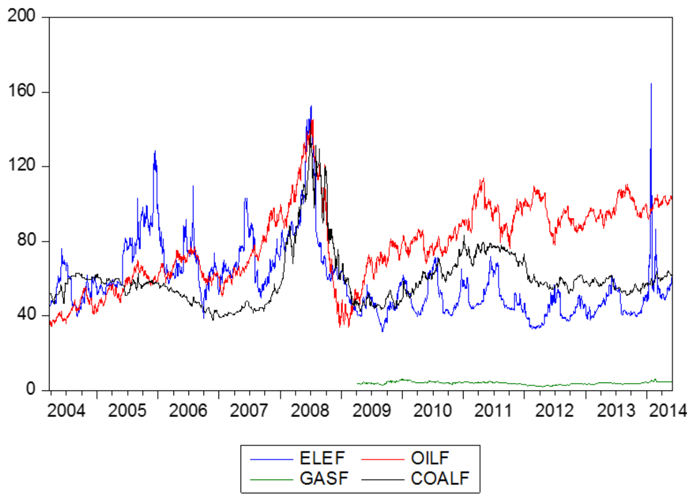

Figure 1. Plot of the energy price variables

We respectively define elef, gasf, oilf, and coalf as the natural logarithms of the future energy prices of electricity, natural gas, oil, and coal. Figure 1 plots the electricity, natural gas, oil, and coal prices. According to Figure 1, we find that electricity futures prices and oil prices are more volatile than coal futures prices. All three energy prices follow an increasing trend from 2004 to 2007, reach a peak at the beginning of 2008, and then sharply decrease at the end of 2008. The oil price is gradually increasing until 2014, while the coal price is volatile until 2014. Finally, the electricity price is volatile over the whole sample period, with a spike at the beginning of 2014.

We estimate the daily price returns by taking the difference in the logarithms of two consecutive prices. Table 1 reports the descriptive statistics for all the daily future price return series. The data suggest that average daily returns range from 0.000135 (for coal) to 0.000505 (for electricity). Unconditional volatility as measured by the standard deviation ranges from 0.011992 (for gas) to 0.039838 (for oil). The skewness value is both positive and negative. Positively skewed returns are found in coal (1.062772) and gas (0.541167) energy prices, while negatively skewed returns are found in oil (-1.287436) and electricity (-0.177480) price returns. The kurtosis coefficients are found to be over three for all the return series. These estimates indicate that the probability distributions of the energy price returns are skewed and leptokurtic. We also apply the Ljung-Box Q statistics returns as well as square returns, which show significant serial autocorrelation in all of the return series. The statistically significant value of the ARCH-LM test indicates that the ARCH effect exists and thusthe estimation of a GARCH model is appropriate.

Table 1. Descriptive statistics for daily price

	OILF	ELEF	COALF	GASF
Mean	0.000271	0.000505	0.000135	0.000202
Median	0.000000	0.000270	0.000000	0.000000
Maximum	0.466792	0.089454	0.267712	0.080253
Minimum	-0.456391	-0.092572	-0.119312	-0.046201
Std.Dev.	0.039838	0.017617	0.031292	0.011992
Skewness	-1.287436	-0.17748	1.062772	0.541167
Kurtosis	49.14148	5.469736	9.427199	7.15335
Jarque-Bera	415.981***	510.592***	16.920***	136.836***
L_BQ(12)	27.101***	26.644***	130.100***	55.939***
L_BQ^2(12)	287.205***	459.160***	843.490***	163.610***
ARCH_LM	132.963***	179.505***	114.869***	6.825***

Note. ***,** and * indicated that significant at 1%,5%, and 10%, respectively.

A stationary process of the return series is tested using the ADF and PP unit root tests. Table 2 shows the results of these tests. Table 2 provides tests of unit roots in the level and first difference of individual energy prices. The results fail to reject the null hypothesis of unit roots in the level, but do reject the hypothesis in first difference. Therefore, we conclude that all of the energy prices are first difference (I(1)) stationary.

Table 2. ADF and PP of unit roots

	ADF		PP	
variables	level	lst difference	level	lst difference
LOILF	-0.699	-53.551***	-0.779	-53.692***
LELEF	-0.110	-51.771***	-0.050	-42.925***
LCOALF	-0.050	-42.925***	-0.046	-43.250***
LGASF	-0.170	-25.460***	-0.194	-41.337***

Note. ***,** and * indicated that significant at 1%,5%, and 10%, respectively.

4. Empirical Results

This section presents the empirical results obtained from estimating multivarite GARCH models. Five multivariate GARCH models (VAR(1)-BEKK-MGARCH, VAR(1)-CCC-MGARCH, VAR(1)-DCC-MGARCH, VAR(1)-VARMA-CCC-MGRCH, and VAR(1)-VARMA-DCC-MGARCH are estimatedto analyze the mean and volatility spillover among electricity price returns and other energy price markets. We also estimate five multivariate asymmetric GARCH models (VAR(1)-BEKK-AMGARCH, VAR(1)-CCC-AMGARCH, VAR(1)-DCC-AMGARCH, VAR(1)-VARMA-CCC-AMGARCH, and VAR(1)-VARMA-DCC-AMGARCH) to set up the volatilities and conditional correlations between the electricity price, oil price, natural gas price, and coal price markets.

4.1 Price and Volatility Spillovers-Symmetric Multivarite GARCH Models

Table 3 and 4 presents the estimation results for five symmetric-MGARCH models. In terms of the mean equations, there are positive and negative statistically significant own mean spillover effects for electricity and gas ($B11$, $B33$, and $B44$). For electricity, gas, and coal, these price markets depend on their own past returns. This finding shows some evidence of short-term predictability for energy price changes over time. For the electricity market mean equation, there is a statistically significant negative coefficient of natural gas price across mean spillover effect to the electricity price market, telling us that an increase of lag one period in natural gas price decrease electricity prices. However, the positively statistical significant coefficient of *B14* indicates that the increasing price of coal also decreases the cost of electricity and then increases the price of electricity. For the coal equation, the estimated coefficient (B34) is positive and statistically significant for all models, exhibiting that the increasing price of coal will increase the price of natural gas. For the oil equation, there is no coefficients are statistically significant at own lag and cross all other price markets. Therefore, there is no evidence for persistence in returns. In general, we find that there are significant price spillover effects from gas and coal prices to electricity prices and for coal prices to gas prices, except for the CCC model. The own lag period price spillover effects are found for electricity, gas and coal prices, but not for oil prices.

Table 3. Multivariate symmetric GARCH parameter estimates(ELEF-OILF-GASF-COALF)

	BEKK		CCC		DCC		VARMA-CCC		VARMA-DCC	
variable	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
Mean										
B10	0.001	0.997	-0.000	-0.252	-0.000	-0.328	0.001***	26.124	0.001***	7.367
B11	0.369***	10.157	0.282***	7.957	0.286***	7.641	0.298***	92.008	0.222***	150.594
B12	-0.011	-0.381	-0.050	-1.589	-0.048	-1.425	-0.029***	95.812	-0.015	-1.117
B13	-0.215***	-8.185	-0.294**	-13.330	-0.289***	-13.095	-0.219***	-93.541	-0.089***	-15.639
B14	0.126**	2.487	0.089*	1.686	0.088	1.486	-0.060***	-26.845	0.035**	2.211
B20	0.000	0.771	0.000	1.154	0.000	1.118	0.001***	124.189	0.000	1.383
B21	-0.007	-0.643	-0.000	-0.483	-0.000	-0.541	-0.013***	-52.288	-0.002	-0.220
B22	0.003	0.136	-0.000	-0.242	-0.000	-0.325	-0.008***	-76.717	0.006	0.282
B23	0.002	0.160	0.014	0.923	0.015	1.024	0.036***	74.657	0.018	1.468
B24	0.001	0.018	0.013	0.378	0.000	0.166	0.044***	50.514	0.004	0.140
B30	0.000	0.238	-0.000	-0.296	-0.000	-0.324	-0.000***	-910.471	0.000*	1.905
B31	-0.010	-0.491	0.012	0.573	0.000	0.089	0.022***	23.893	-0.029***	-3.492
B32	0.033	0.924	-0.000	-0.169	0.000	-0.045	-0.000***	-26.426	-0.059*	-3.173
B33	-0.086***	-3.406	-0.160***	-5.313	-0.137***	-4.430	-0.139***	-36.593	-0.077***	-5.012
B34	0.197***	3.474	0.209***	3.534	0.200***	3.293	0.146***	52.564	0.195***	4.940
B40	0.000	0.725	0.000	0.520	0.000	0.346	0.000***	553.216	0.000	1.465
B41	0.010	1.177	-0.000	0.589	0.000	0.624	-0.005***	-10.983	0.000	0.296
B42	-0.024	0.016	-0.029*	-1.699	-0.029*	-1.773	-0.028***	-17.089	-0.022	-1.829
B43	-0.010	0.009	-0.014	-1.4197	-0.014	-1.352	-0.007***	-28.276	-0.011	-1.049
B44	0.243***	10.187	0.271***	0.031	0.268***	8.208	0.279***	22.608	0.273***	10.892
Variance										
C(1,1)	0.013***	16.303	0.000***	8.231	0.000	0.346	0.000***	145.043	-0.000***	-19.800
C(2,1)	-0.000	-0.168								
C(2,2)	0.001***	3.913	0.000**	2.196	0.000***	7.875	0.000***	35.210	0.000***	78.006
C(3,1)	0.003***	3.561								
C(3,2)	0.002	1.679								
C(3,3)	0.000	0.001	0.000***	3.666	0.000***	3.696	-0.000***	-106.38	0.001***	53.568
C(4,1)	-0.000	-0.007								
C(4,2)	-0.002***	-3.629								
C(4,3)	-0.000	-0.002								
C(4,4)	0.000	0.000	0.000**	2.256	0.000**	2.354	0.000***	32.091	0.000***	13.108
A(1,1)	1.071***	27.773	0.807***	8.985	0.776***	9.222	0.488***	56.328	0.581***	137.125
A(1,2)	-0.001	-0.650					-0.279***	-33.952	-0.159**	-6.979
A(1,3)	0.089***	3.514					0.169***	88.922	-0.177***	-15.812
A(1,4)	0.003***	0.323					-0.467***	-344.988	-0.125***	-4.439
A(2,1)	-0.116***	-2.875					0.015***	15.321	0.008***	3.498
A(2,2)	0.097***	4.283	0.043***	4.426	0.045***	3.759	0.131***	60.272	0.031***	29.595
A(2,3)	0.073**	1.925					0.372***	252.507	0.017***	2.846
A(2,4)	0.018	1.336					-0.037***	-76.246	0.034***	5.076

Table 4. Multivariate symmetric GARCH parameter estimates (Continued)

	BEKK		CCC		DCC		VARMA-CCC		VARMA-DCC	
variable	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
A(3,1)	-0.599***	-15.699					0.063***	306.670	0.005***	7.346
A(3,2)	-0.019*	-1.683					-0.072***	-97.945	-0.078***	-9.182
A(3,3)	0.126***	4.355	0.065***	6.309	0.068***	6.421	0.030***	131.174	0.258***	62.966
A(3,4)	0.028***	3.051					-0.078***	-82.657	-0.327***	-32.346
A(4,1)	0.521***	7.844					-0.025***	-18.850	-0.026***	-34.355
A(4,2)	0.050*	1.966					-0.022***	-38.155	-0.058***	-6.908
A(4,3)	0.023	0.420					0.043***	49.866	0.019*	2.11808
A(4,4)	0.128***	4.447	0.126***	4.603	0.138***	4.826	0.117***	109.211	0.158***	13.673
B(1,1)	0.535***	26.133	0.360***	8.805	0.374***	9.683	0.462***	135.732	-0.212***	-187.348
B(1,2)	0.003	0.539					4.268***	98.492	-0.208*	-1.676
B(1,3)	-0.039*	-2.488					0.818***	60.271	3.465***	377.545
B(1,4)	-0.001	-0.185					-5.898***	-38.454	-6.457***	104.023
B(2,1)	-0.035	-1.060					1.852***	43.854	-0.083***	-4.8800
B(2,2)	0.989***	344.974	0.947***	79.792	0.945***	63.489	0.644***	116.492	0.928***	477.916
B(2,3)	-0.052***	-5.249					0.718***	75.411	0.013***	9.936
B(2,4)	0.009*	2.284					0.444***	199.367	0.135***	20.534
B(3,1)	0.156***	8.139					-0.081***	-295.639	0.616***	117.705
B(3,2)	0.008**	2.317					2.123***	773.463	1.773***	54.106
B(3,3)	0.982***	111.980	0.913***	71.351	0.910***	69.415	0.824***	797.299	-0.113***	-34.812
B(3,4)	-0.020***	-6.005					1.080***	657.123	3.869***	75.107
B(4,1)	0.093	1.515					-0.194***	-326.372	-0.103***	-5.144
B(4,2)	0.002	0.177					-0.485***	-45.066	0.482***	22.468
B(4,3)	0.145***	6.309					0.904***	55.341	0.336***	23.918
B(4,4)	0.980***	85.318	0.733***	8.944	0.709***	8.326	0.197***	18.174	0.294***	19.967
R(2,1)			0.020	0.777			-0.008***	-64.189		
R(3,1)			0.468***	23.452			0.470***	54.507		
R(3,2)			0.133***	5.175			0.109***	626.596		
R(4,1)			0.134***	5.221			0.127***	104.461		
R(4,2)			0.259***	11.059			0.245***	943.169		
R(4,3)			0.215***	8.488			0.209***	426.658		
DCC(1)					0.029*	2.545			0.012***	53.265
DCC(2)					0.642***	4.618			0.841***	36.834
LogL	13707.376		13645.867		13647.200		13689.225		13695.462	
AIC	-10.221		-10.460		-10.588		-10.734		-10.978	
SBC	-10.107		-10.235		-10.370		-10.555		-10.811	

Note. ***, ** and * indicated that significant at 1%, 5%, and 10%, respectively.

For the variance equation, the elements of the A matrix are estimated coefficients for the ARCH volatility that measure short-term volatility persistence. The own conditional ARCH effects A_{11}, A_{22}, A_{33} and A_{44} are statistically positive significant at the 1% level, presenting considerable evidence of short-term persistence. In addition, the conditional variances are a function of the own lagged covariance and lagged cross-product of the shocks. From the variance equation, the BEKK and VARMA-GARCH models also measure short-term volatility spillover between energy prices. The positive and significant coefficients ofA_{13}state that a shock of gas volatility spills over to the electricity price market. The negative statistically significant coefficient of A_{32} displays cross and feed-back effects between oil and gas markets.

For the variance equation, own conditional GARCH effect (B_{ij}), the elements of B matrix are the estimated coefficients for the GARCH volatility thatmeasure long-term persistence. According to the variance equation of Table 4, the positive and statistically significant coefficients of B_{ij} note own long-term volatility persistence. From the variance equation, we observe that, in addition to own past innovations, the conditional variance in each market is also affected by innovations coming at least from one of the other markets. There are positive significant volatility spillovers from the coal price market to the oil price market, the oil price market to the gas price market, and the gas price market to the coal price market. However, for the VARMA-CCC and DCC models, the positive significant volatility spillover effectsare from gas to electricity, while there are negative effects from coal to electricity. Those energy price volatility spillovers affecting each other directly or indirectly may be due to common fundamental factors that influence energy equity markets.

For the DCC model, the estimations of the DCC parameter (DCC(1) and DCC(2)) are positively statistically significant at the 1% level for the DCC and VARMA models. These estimated coefficients sum to a value that is less than one, indicating that the dynamic conditional correlations are mean reverting and the significantly coefficients leading to a rejection of the assumption of CCC for all news to return. The short-run persistence of shocks on DCC is the highest for electricity at 0.776, while the largest long-run persistence of shocks to DCC is 0.945 for oil. The magnitude of the DCC estimator of the VARMA model is greater than that for the DCC model. As in the case of Table 4, the estimated value of short-run own volatility persistence is larger than the cross volatility effect for the electricity market, and the estimated value of the long-run own volatility persistence is also larger than the cross volatility effect for each market under the BEKK model.

For the residual diagnostic test of Table 5, the estimated coefficients of the AIC and SBC criteria display that the VARMA-DCC model is the best model for each of the energy markets. The residual diagnostic test of the standardized residuals (Q-statistics) exhibits no statistically significant evidence of autocorrelation in the standardized results (ARCH effect) at the 1% level. Moreover, the Q-square statistics show no statistically significant evidence of the GARCH effect at the 1% level. Based on the residual diagnostic test, we find that the VARMA-DCC model is chosen as the best of the models versus the other MGARCH models.

Table 5. Residual diagnostic test

	BEKK				CCC				DCC				VARMA-CCC				VARMA-DCC			
	Elef	Oilf	Gasf	Coalf	Elef	Oilf	Gasf	Coalf	Elef	Oilf	Gasf	Coalf	Elef	Oilf	Gasf	Coalf	Elef	Oilf	Gas	Coalf
ARCH-LM	1.168	0.657	0.731	0.505	1.011	0.704	0.711	0.547	1.002	0.599	0.762	0.613	1.332	0.697	0.701	0.585	1.057	0.607	0.709	0.609
Q -stat	20.34	18.66	11.79	15.61	20.71	18.19	12.01	15.69	21.12	19.00	11.11	15.79	20.88	16.99	10.89	15.14	22.8	18.71	11.91	15.77
Q^2 -stat	7.69	5.71	4.88	7.25	7.99	5.32	5.09	6.98	6.99	5.11	3.97	7.33	7.13	5.43	5.16	6.90	7.81	5.32	4.79	7.14

4.2 Price and Volatility Spillover-Asymmetric Multivariate GARCH Models

We now can discuss the results estimated by the four-variable asymmetric MGARCH models as presented in Table 6 and 7. Regression results are presented for five models: VAR(1)-BEKK-AGARCH, VAR(1)-CCC-AGARCH, VAR(1)-DCC-AGARCH, VAR(1)-CCC-VARMA-AGARCH, and VAR(1)-DCC–VARMA-AGARCH. We first look at the mean equation, with electricity, natural gas, and coal price current returns depending on their own past returns (B_{11}, B_{33} and B_{44}). Here, the one-period lagged values of the energy price returns are largely determined by their current values at different levels. This suggests that the past returns can be used to forecast future returns in these markets, indicating short-term predictability in energy price changes. For the electricity, natural gas, and coal price markets, the lag one period return influences the current return. For the electricity equation, the estimated coefficients of $B_{12}$and B_{13} are each negative and statistically significant in each of the three models that are not VARMA. It indicates the return transmission from oil and gas to the electricity market. For the gas equation, the estimated coefficients of B_{34} are positive and statistically significant in each specification. In terms of the information transmission through returns, the natural gas price returns are affected by the coal price returns. For the oil and coal equations, there is no considerable evidence of the estimated coefficients being statistically significant across all models. The analysis shows that the electricity, gas, and coal returns are more related to their own past returns, however, there is not much evidence of price transmission effects in mean equations, except for oil and gas to electricity and for gas to coal.

Table 6. Multivariate asymmetric GARCH parameter estimates (ELEF-OILF-GASF-COALF)

	BEKK		CCC		DCC		VARMA-CCC		VARMA-DCC	
variable	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
Mean										
B10	0.0005	0.8381	-0.0005	-1.1255	-0.0034***	-7.5841	0.0010***	10.4853	0.0011***	163.5935
B11	0.3714***	10.3146	0.2721***	6.7986	0.3890***	15.5073	0.1692***	28.3297	0.1547***	864.7315
B12	-0.1167	-0.3868	-0.0457***	-3.8492	-0.1003***	-4.5681	-0.0679***	-29.7524	-0.0964***	-87.2012
B13	-0.1998***	-7.2591	-0.2957***	-21.1135	-0.2435***	-21.5290	0.0122***	6.7214	0.0093***	115.1704
B14	0.1345***	2.6893	0.08918**	2.0581	-0.0029	-0.1369	-0.0152***	-5.2089	-0.0822***	-508.1074
B20	0.0000	0.1139	0.0002	0.6435	0.0001	0.1981	0.0004	1.6147	0.0001***	38.2693
B21	-0.0126	-1.1883	-0.0043	-0.4298	-0.0067	-0.7144	0.0007	0.1309	-0.01311***	-143.5341
B22	-0.0033	-0.1306	-0.0042	-0.1653	0.0494*	1.8463	-0.003	-1.0774	0.0000***	42.0473
B23	0.0071	0.5335	0.0108	0.7958	0.0154	1.1709	0.0063***	2.3864	0.01378***	97.4384
B24	0.0063	0.1908	0.0259	0.7917	-0.0433	-1.2780	0.0184***	3.0501	0.0156***	49.9715
B30	0.0001	0.1249	-0.0009	-1.4904	-0.0027***	-3.9844	-0.0003***	-3.4881	-0.0004***	-94.9822
B31	0.0123	0.5832	0.0094	0.5325	0.0054	0.3309	-0.0219***	-2.7594	-0.0255***	-856.2304
B32	0.0312	0.9192	-0.0032	-0.0961	-0.0300	-0.8158	0.0002	0.0068	0.0061***	34.0973
B33	-0.0803***	-3.1604	-0.1514***	-6.3006	-0.0829***	-3.2073	-0.0289***	-3.6516	-0.0274***	-89.6655
B34	0.2051***	3.8090	0.1925***	3.3982	0.1689***	3.0141	0.1655***	4.7775	0.1445***	77.3832
B40	0.0000	0.2118	-0.0000	-0.3977	-0.0007***	-3.2957	0.0001*	1.7829	-0.0000***	-61.6670
B41	0.0067	0.8122	0.0049	0.7300	-0.0045	-0.6531	0.0002	0.1861	-0.0036***	-574.3116
B42	-0.0274	-1.6353	-0.0374***	-4.0693	-0.0201	-1.3498	-0.0265***	-18.0473	-0.0229***	-318.0272
B43	-0.0038	-0.3903	-0.0186**	-2.5445	0.0089	0.9420	-0.0145***	-11.9170	-0.0143***	-508.2969
B44	0.2246***	8.9705	0.2872***	12.5279	0.2277***	9.2108	0.2834***	94.9589	0.2683***	687.2374
Variance										
C(1,1)	0.0128***	13.0731	-1.7730***	-11.6768	-2.6018***	-156.1905	0.0000***	18.4718	0.0002***	341.8299
C(2,1)	0.000	0.0365								
C(2,2)	-0.0000***	-2.6416	-0.3191***	-4.4466	-0.2309***	-19.0519	-0.0000***	-39.9018	-0.0000***	-102.8287
C(3,1)	0.0024***	2.8907								
C(3,2)	-0.0019	-3.0719								
C(3,3)	0.0000	0.0003	-0.3363***	-5.2382	-2.3616***	-126.738	-0.0000	-15.1247	-0.0001***	-587.2904
C(4,1)	-0.0004	-0.7126								
C(4,2)	0.0014	3.6142								
C(4,3)	0.0000	-0.0008								
C(4,4)	0.0000	-0.0001	-1.1874***	-3.8423	-4.7149***	-223.5130	0.0000***	391.4862	0.0003***	553.584
A(1,1)	0.9906***	16.6481	0.7029***	13.7594	0.8677***	16.5046	0.4696***	541.5870	0.5539***	547.307
A(1,2)	-0.0117	-1.1492					-0.3232***	-628.2661	-0.2731***	-178.7385
A(1,3)	0.1105***	4.4816					0.1080***	311.9547	0.006***	109.147
A(1,4)	0.0005	0.0597					-0.5029***	-660.2993	-0.4325***	-643.6746
A(2,1)	-0.1395***	-3.8899					0.0049***	2.5559	-0.0052***	-183.4503
A(2,2)	0.0704***	3.0718	0.0563***	2.6919	0.0381***	2.3064	0.0131***	39.5071	0.0310***	129.9564
A(2,3)	0.0473	1.4012					0.0195***	5.2335	0.0163***	184.7724
A(2,4)	0.0306	2.3933					0.0172***	13.2711	-0.0750***	-90.7212

Table 7. Multivariate asymmetric GARCH parameter estimates (Continued)

	BEKK		CCC		DCC		VARMA-CCC		VARMA-DCC	
variable	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
A(3,1)	-0.5837***	-14.4702					0.0774***	103.0077	0.0696***	896.5051
A(3,2)	-0.0026	-0.2077					-0.0889***	-241.6020	-0.0644***	-972.5368
A(3,3)	0.0982***	3.9872	0.1076***	4.9433	0.1114***	3.2359	0.0060***	43.8808	0.0132***	354.4112
A(3,4)	0.0178**	1.7684					-0.0596***	-113.5523	-0.1382***	-243.2561
A(4,1)	0.5011***	7.0990					-0.0207***	-46.1477	-0.0215***	-872.3318
A(4,2)	0.0348	1.2589					-0.0181***	-17.7386	0.0074***	166.5552
A(4,3)	-0.0050	-0.1003					-0.0183***	-27.4592	0.0129***	339.6110
A(4,4)	0.1571***	6.6407	0.3427***	7.0914			0.1671***	173.9846	0.1354***	108.3268

B(1,1)	0.5371***	14.2868	0.8075***	40.6289	0.7060***	234.5857	0.3466***	622.7646	0.3489***	542.3000
B(1,2)	0.0047	0.9204					-7.1517***	-169.6084	-2.1213***	-170.0603
B(1,3)	-0.0494***	-3.3752					0.2278***	165.3743	0.5102***	827.3705
B(1,4)	0.0004	0.0729					6.6825***	211.2386	-1.5161***	-306.7516
B(2,1)	-0.0252	-0.7606					-0.1368***	-15.0551	0.2262***	576.7915
B(2,2)	0.9768***	239.4175	0.9688***	120.3086	0.9771***	545.0635	0.8313***	736.5626	0.7711***	257.9075
B(2,3)	-0.0399***	-4.2078					-0.0621***	-68.2129	-0.1143***	-857.4574
B(2,4)	0.0036	0.9754					0.8374***	232.5602	1.0322***	145.5392
B(3,1)	0.1632***	7.2657					-0.1309***	-458.0361	-0.1188***	-166.6380
B(3,2)	0.0025	0.6859					0.9055***	753.8301	0.6952***	443.1556
B(3,3)	0.9836***	125.6959	0.9666***	111.5630	0.6909***	271.9692	0.9399***	180.9301	0.8717***	774.7384
B(3,4)	-0.0186***	-5.2618					0.1939***	145.0952	1.0722***	691.6434
B(4,1)	0.1294***	1.9555					-0.1292***	-102.4268	-0.2034***	-152.6042
B(4,2)	-0.0046	-0.6487					-0.0331***	-26.2901	-0.1213***	-899.6343
B(4,3)	0.1325***	6.5452					0.7168***	265.5727	0.5960***	122.8240
B(4,4)	0.9722***	105.0047	0.8916***	27.2016	0.5006***	215.4998	0.4169***	376.9435	0.3563***	116.4740
D(1,1)	0.6175	4.6450	-6.8075***	-2.5188	-1.0901	-0.3611	0.0278***	90.5814	0.0703***	330.0173
D(1,2)	-0.0045	-0.5436								
D(1,3)	0.0062	0.2473								
D(1,4)	-0.0076	-1.0467								
D(2,1)	-0.6176	-0.7963								
D(2,2)	-0.2164***	-7.5273	123.6544***	4.0499	104.007***	22.7549	0.1029***	110.0251	0.1484***	49.7687
D(2,3)	-0.1331***	-2.7783								
D(2,4)	-0.0281	-1.4822								
D(3,1)	-0.2988***	-3.9069								
D(3,2)	0.0374***	2.1826								
D(3,3)	0.1871***	4.1798	41.9337***	2.4779	280.3582***	8.6447	0.0264***	61.4916	0.0339***	881.0117
D(3,4)	0.0788***	4.7784								
D(4,1)	0.1678	1.1625								
D(4,2)	-0.1886***	-5.9063								
D(4,3)	-0.0494	-0.6974								
D(4,4)	-0.1538***	-3.7335	-601.8449***	-3.5287	-169.4496	-0.8286	-0.0669***	-88.9717	0.0226***	796.8398
R(2,1)			0.0212	0.9129			0.0224***	157.8751		
R(3,1)			0.4705***	23.6116			0.0491***	767.3811		

Note. ***,** and * indicated that significant at 1%,5%, and 10%, respectively.

Turning to the conditional variance equations, the current conditional volatility of the energy markets is determined by their both own conditional ARCH effects (A_{ij}) that estimate the short-run persistence and own conditional GARCH effects (B_{ij}), which measure long-term persistence. The cross-market shock effects (α_{ij}) and volatility effects (B_{ij}) also can be found from the conditional variance equation. According to Table 8, the estimated result of the ARCH and GARCH coefficients for own conditional shock and volatility show positive and statistical significance at the 1% level (0.9906, 0.0704, 0.0982, and 0.1571 for the short-term persistence effect and 0.5371, 0.9768, 0.9836, and 0.9722 for the long-term persistence effect). A larger coefficient of the GARCH effect versus the ARCH effect implies that the former effect exhibits significant volatility impacts of conditional volatility on the energy markets.

Table 8. Residual diagnostic test

	BEKK				CCC				DCC				VARMA-CCC				VARMA-DCC			
	Elef	Oilf	Gasf	Coalf	Elef	Oilf	Gasf	CoalMS Userf	Elef	Oilf	Gasf	Coalf	Elef	Oilf	Gasf	Coalf	Elef	Oilf	Gasf	Coalf
ARCH-LM	0.877	0.930	0.256	0.404	0.961	0.998	0.310	0.523	0.865	0.840	0.330	0.572	0.792	1.205	0.472	0.313	1.151	1.124	0.665	0.533
Q -stat.	13.267	15.140	18.220	19.335	12.676	14.981	19.499	19.792	12.722	14.519	17.018	19.664	13.903	16.424	19.118	19.015	12.803	15.832	19.067	19.009
Q^2 -stat.	3.169	6.770	7.161	10.322	4.164	5.260	9.330	8.740	4.019	5.126	6.128	9.977	4.279	6.199	8.073	9.653	3.925	6.635	7.094	8.039

5. Conclusions

Previous academic studies have shown that the electricity, oil, natural gas, and coal markets are characterized by high volatility and that they have become more interrelated. Therefore, analyzing the co-movement between these markets as well as their volatility spillovers is very important for investors, traders, and government agencies concerned with the energy markets.

This study has investigated and examined the conditional correlations and volatility spillovers among electricity, oil, natural gas, and coal future price returns, by using the five multivariate symmetric GARCH and asymmetric GARCH models: the BEKK model of Engle and Kroner (1995), the CCC model of Bollerslev (1990), the DCC model of Engle (2002), the VARMA-GARCH model of Ling and McAleer (2003), and the VARMA-AGARCH model of McAleer et al. (2008). We employ a sample size of 2660 observations from March 22, 2004 to May 29, 2014. The empirical results show that these models do capture the dynamic structure of the return interactions and volatility spillovers and display statistical significance for own past mean and volatility short-and long-run persistence effects, while there are just a few cross-market effects for each model.

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Monetary Policy and Output Growth Forecasting in a SVAR Perspective

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Abstract

This paper presents a short-term forecasting model of monthly South African macroeconomic variables to estimate the effects of monetary policy on output growth from a Structural Vector Autoregression ($SVAR$) perspective. A set of forecasting experimentations are carried out to evaluate the out-of-sample static and dynamic forecast for the post-apartheid period. We carried out a combined forecast in order to compare the static with dynamic forecasting approach for improving output growth. The findings reveal that money supply is observed to exert a significant positive impact on output growth from about the eighth month. In addition, the dynamic forecasting is observed to have a more robust result and outperforms the static forecasting. It clearly brings out the growth patterns (increase and decrease) and can be justified and recommended to policymakers in calculating or in predicting the outcome of monetary policy actions for future development. However, in order to improve the predictive forecasting accuracy, the study recommends combined forecasting as dynamic forecasting is associated with risk and uncertainty that is central to its prediction and expected reliability.

Keywords: monetary policy, output growth forecasting, structural VARs

1. Introduction

Generally, many studies have used time series macroeconomic variables to forecast output growth using low-dimensional methods such as Generalized Method of Moments (GMM), Vector Autoregression (VAR) and Single-equation Regression among others. These low-dimensional methods omit thousands of important variables that are available to economic forecasters due to constraints in accommodating a large number of variables. They are further constrained by degree of freedoms. However, to ensure forecast accuracy and good predictive power of a model, one needs to impose adequate restrictions so that the number of estimated parameters is kept small (Stock & Watson, 2004). One way to impose such restrictions and employ a high-dimensional system is to assume that the variables have a dynamic factor structure model. Stock and Watson (2002) and Forni et al. (2003) suggest that there are potential gains from forecasting using high-dimensional dynamic factor structural models. This context furnishes this study with two objectives. First, the study aims to estimate the effects of monetary policy on output growth in South Africa using a Structural Vector Autoregression ($SVAR$) model. The second objective is to forecast the time series data used in the model and determine the predictive power and accuracy of the $SVAR$ model. After an extensive review of the literature, there is, to the best of the researchers' knowledge, no study that has estimated monetary policy and output growth in South Africa as well as those employing a $SVAR$ model.

The monetary policy linkage of the South African economy arises from the interdependence of the financial sector and the industrial sector for meeting the needs of productive input and output to boost investment. The impact of funds supplied by the financial sector increases industrial production, while the interest paid on those funds increases the money growth that the financial institution is able to supply to the economy.

However, natural rate models suggest that monetary policy will not have a significant impact on the business cycle in stimulating economic activity with respect to output and employment in the long run (see Sargent & Wallace, 1975; Barro & Gordon, 1983). Their view is that there is a limited effect of monetary policy on output growth. Ping (2004) carried out a study in China and found evidence for the existence of long run monetary neutrality in stimulating output growth and employment (monetary authority mandates is to stabilize prices). Nevertheless, it is observed that an increase in monetary growth provides incentives to monetary authorities to pursue countercyclical policies. These in turn promote the goals of maximum employment, stable prices, and moderate long-term interest rates. This behaviour is consistent with the rational expectation that when prices are stable, belief is likely to remain that the prices of goods, services, materials and labour are undistorted by inflation and serve as strong signals and guides for the efficient allocation of resources and boosting of investments, inadvertently contributing to higher standards of living. The view that there is a monetary policy linkage to stimulating output growth further motivated us to estimate the effects of monetary policy on output growth from a $SVAR$ perspective and also determine the predictive accuracy of the model.

In addition to monetary policy linkages to stimulating output growth, the pursuit of output growth and stable prices fosters savings and capital formation, which encourages households and businesses to increase their investments. Goodfriend's (1997) study provides a meticulous analysis explaining the role of quantitative monetary expansion for effective monetary policy that can have an important effect on real economic activities. An effective monetary policy system will lead to an increase in the capacity of an economy to produce goods and services, and consequently lead to qualitative changes in the economy via output growth and employment generation.

Conversely, the optimum monetary policy linkage between interest rates and money supply rules in promoting output growth and sustainable development has also become a topic of lively interest. The interest centres on the use of interest rates and money supply to stimulate the economy. Taylor (1997, p. 36) points out that deflation in Japan "made an interest rate rule unreliable, calling for greater emphasis on money supply rules". Friedman (1997), Hayashi (1998) and Meltzer (1998) provide recent reports along these lines for money supply as the optimum monetary policy rule. Woodford (2001) holds an opposing view and believes that an optimal rule will generally involve a commitment to history-dependent behaviour; in particular, a more gradual adjustment of the level of interest rates has important advantages in stimulating output growth. Orphanides and Wieland (2000) discuss along these lines how monetary policy may continue to use interest rate instruments on an operational level, if that is deemed more appropriate by the central bank, and optimal interest rates respond to inflation. However, if both rules are applied together, the process of sustainable development that the monetary authorities are aiming to achieve, especially when targeting output growth and price stability, will be fast-tracked.

2. The Instruments of Policy and Targets by Monetary Authorities

According to Mishkin (2007), all central banks pursue a different strategy in the conduct of monetary policy by aiming at a variable that falls within its tools to achieve as its goal. Having decided on the goal needed to stimulate output and price, the policy maker then selects from existing tools to achieve those goals. The central bank chooses a target known as an *intermediate target* (such as a short/long-term interest rate and monetary aggregate) that has a direct effect on the monetary policy goal (stimulating output and prices). However, if these targets are not directly affected by the central bank's tools, then it chooses another target known as the *operating target* (Mishkin, 2007*)*. According to Mishkin, the monetary policy authorities use monetary policy tools, which may not affect monetary policy goals directly. Rather, they affect intermediate targets or the operating targets of monetary policy. The term intermediate target is used to differentiate between the monetary authorities' targets drawn from the ultimate monetary goal variables (such as the unemployment rate, inflation rate, growth rate of output, price stability, interest rates and the stability of the financial markets), and the operating variables such as the central bank's reserves and the federal fund rates', which are more responsive to policy tools.

A reserve bank employs the strategy of pursuing intermediate and operating targets because it is easier to achieve a goal by aiming at a target, than by aiming at a goal directly. Aiming directly at a goal can be disastrous if a reserve bank waits to see what the output and price level will be after a specific period (say one year) and this is not achieved. Therefore, through its operating tools, the South African Reserve Bank (SARB), for example, can stimulate output growth and achieve price stability in the country.

3. Methodology

Since this study attempts to estimate the effects of monetary policy on industrial output growth in South Africa using a $SVAR$ approach, the brief description of the methodology that is used is described in this section. The $SVAR$ model is a multivariate and linear representation of a vector of observable variables on its own lags. All the observable variables are assumed to be endogenous and interdependent, except for those identified as exogenous. In addition, the model is an economically interpretable simplification of the VAR model, where the structural identification (factorization) restrictions are used in line with some economic theory.

3.1 SVAR Framework

The $SVAR$ in this study is estimated using six endogenous variables, namely, Industrial Output (IP), Aggregate

Output (AG), Exchange Rate (EX), Inflation Rate (IF), Interest Rate (IN) and Money Supply (MS) and two exogenous variables, namely, the global Commodity Price (COMM) and the global Oil Price (OP).

Supposing the South African economy can be denoted by the following structural equation:

$$AY_t = \alpha_0 + A_1^* Y_{t-1} + \cdots \ldots \ldots + A_p^* Y_{t-p} + B_0^* X_t + \cdots \ldots . + B_q^* X_{t-q} + B\varepsilon_t \tag{1}$$

where A is an invertible (8×8) matrix describing the contemporaneous relationship among the variables; Y_t is a (8×1) vector of endogenous variables such that $Y_t = Y_{1t,} Y_{2t,} \ldots Y_{nt}$. α_0 is a (8×1) vector of constant terms; $A_1^* - A_p^*$ is a (8×8) matrix of coefficients of lagged endogenous variables (for every $i = 1 \ldots p$); $B_0^* - B_q^*$ and $X_t . \ldots X_{t-q}$ are coefficients and vectors of lagged exogenous variables, respectively, capturing external shocks; B is a (8×8) matrix whose non-zero off-diagonal elements allow for direct effects of some shocks on more than one endogenous variable in the system; and ε_{it} is a vector of white-noise structural disturbances (uncorrelated error terms).

Sharifi-Renani (2010) argues that the point of departure for a structural analysis is a reduced form model that has to be specified before the $SVAR$ analysis can be entered. Therefore, equation 1 has to be transformed into a reduced form by pre-multiplying it by an inverse of A in line with Ngalawa and Viegi (2011) as:

$$A^{-1}AY_t = A^{-1}\alpha_0 + A^{-1}A_1^* Y_{t-1} + \cdots \ldots \ldots + A^{-1}A_p^* Y_{t-p} + A^{-1}B_0^* X_t + \cdots \ldots . + A^{-1}B_q^* X_{t-q} + A^{-1}B\varepsilon_t \tag{2}$$

This gives:

$$Y_t = A^{-1}\alpha_0 + A^{-1}A_1^* Y_{t-1} + \cdots + A^{-1}A_p^* Y_{t-p} + A^{-1}B_0^* X_t + \cdots . + A^{-1}B_q^* X_{t-q} + A^{-1}B\varepsilon_t \tag{3}$$

One can denote:

$$A^{-1}\alpha_0 = \beta_0,\ A^{-1}A_1^* = A_i\ for\ every\ i = 1 \ldots . p, A^{-1}B_0^* = \alpha_i\ for\ every\ i \ldots . . q \text{ and } A^{-1}B\varepsilon_t = \mu_t$$

Hence, equation 3 becomes:

$$Y_t = \beta_0 + A_1 Y_{t-1} + \cdots + A_p Y_{t-p} + \alpha_1 X_t + \cdots . + \alpha_q X_{t-q} + \mu_t \tag{4}$$

The variance between equations (1) and (4) is that the first is called a long form $SVAR$ that cannot be estimated directly due to the feedback inherent in the VAR process (Enders, 2004) as the endogenous variables have a contemporaneous (immediate) effect on each other in the current and past realization time path of AY_t. Equation 4 is called a reduced form $SVAR$ in which no variable has a direct contemporaneous (immediate) effect on another in the model. Additionally, the error term (μ_t) is a composite of shocks in Y_t (Enders, 2004).

Note that equation 4 can be splitting as:

$$Y_t = IP, AG, EX, IF, IN\ and\ MS \tag{4.1}$$

$$X_t = COMM\ and\ OP \tag{4.2}$$

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{21} & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{31} & 0 & 1 & 0 & 0 & 0 & 0 & \alpha_{38} \\ \alpha_{41} & 0 & \alpha_{43} & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & \alpha_{53} & \alpha_{54} & 1 & \alpha_{56} & 0 & 0 \\ \alpha_{61} & \alpha_{62} & 0 & 0 & \alpha_{65} & 1 & \alpha_{67} & 0 \\ \alpha_{71} & \alpha_{72} & \alpha_{73} & \alpha_{74} & \alpha_{75} & \alpha_{76} & 1 & 0 \\ 0 & 0 & 0 & 0 & \alpha_{85} & \alpha_{86} & 0 & 1 \end{pmatrix} \begin{pmatrix} \mu_t^{logOP} \\ \mu_t^{logCOMM} \\ \mu_t^{logIP} \\ \mu_t^{logAG} \\ \mu_t^{logIF} \\ \mu_t^{logMS} \\ \mu_t^{EX} \\ \mu_t^{IN} \end{pmatrix} = \begin{pmatrix} \varepsilon_t^{logOP} \\ \varepsilon_t^{logCOMM} \\ \varepsilon_t^{logIP} \\ \varepsilon_t^{logAG} \\ \varepsilon_t^{logIF} \\ \varepsilon_t^{logMS} \\ \varepsilon_t^{EX} \\ \varepsilon_t^{IN} \end{pmatrix} \tag{5}$$

The terms μ_t^{logOP}, $\mu_t^{logCOMM}$, μ_t^{logIP}, μ_t^{logAG}, $\mu_t^{logIF}, \mu_t^{logMS}, \mu_t^{EX}\ and\ \mu_t^{IN}$ are residuals in the reduced form disturbances to both the domestic and foreign variables and further represent unexpected movements (given information in the system) of each variable; and ε_t^{logOP}, $\varepsilon_t^{logCOMM}$, ε_t^{logIP}, ε_t^{logAG}, ε_t^{logIF}, $\varepsilon_t^{logMS}, \varepsilon_t^{EX}\ and\ \varepsilon_t^{IN}$ are the structural shocks associated with the respective equations.

3.2 The Identification Restrictions

The $SVAR$ methodology suggests the imposition of restrictions on the contemporaneous structural parameters only for reasonable economic structures to be derived. The work of Buckle et al. (2007) sets the foundation for the traditional $SVAR$ that forms the hybrid approach to structural identification. The main adjustments to the Buckle et al. (2002) model contain the incorporation of identifications to which restrictions' methodology is applied. The restrictions restrict attention to rotations that produces shocks that satisfy an anticipated sign in the responses of key variables (see Dungey & Fry, 2009). The traditional restrictions are denoted by "NA" (referred as αij in equation 5) and "0" for the contemporaneous and sluggish lagged relationships, respectively. A total of 36 zero restrictions were imposed on matrix A, which makes the covariance matrix of the reduced-form residuals restricted. The matrix A is the finite-order lag polynomial matrix that clearly demonstrates how the structural restrictions are being estimated with the diagonal constrained to be "1" and the B matrix is the diagonal matrix that is orthogonal (uncorrelated). Eight by eight matrices are formed using the AB-model of Amisano and Gianini (1997, 2012) to impose short run structural restrictions on the model given as:

$$A=\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ NA & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ NA & 0 & 1 & 0 & 0 & 0 & 0 & NA \\ NA & 0 & NA & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & NA & NA & 1 & NA & 0 & 0 \\ NA & NA & 0 & 0 & NA & 1 & NA & 0 \\ NA & NA & NA & NA & NA & NA & 1 & 0 \\ 0 & 0 & 0 & 0 & NA & NA & 0 & 1 \end{bmatrix} \quad B=\begin{bmatrix} NA & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & NA & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & NA & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & NA & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & NA & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & NA & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & NA & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & NA \end{bmatrix} \quad (6)$$

3.3 Data and Data Sources

The model consists of eight monthly time series data spanning a period of twenty years from 1994:1 to 2013:12. The study's starting period is the post-apartheid period and the cut-off dates are dictated by data availability. The data are obtained from the South African Reserve Bank (SARB), Statistics South Africa (Stat SA), World Bank's World Development Indicators (WDI) and the Quantec Database. The Aggregate Output Production (AG) (without industrial output production (i.e., GDP minus IP)) and Industrial Output Production (IP) represent the domestic activity and characterize the goods market in the economy. M2 is the Money Supply (MS) and captures the monetary aggregate while Exchange Rates (EX) is the official Rand to Dollar exchange rate as fixed by the Reserve Bank. They both represent our policy variables. The Interest Rate (IN) is the repo rate and the Consumer Price Index (CPI) is proxied to capture the inflation rate (IF) in the economy. Both variables also serve as instrumental variables in the control of the monetary authority. Finally, the global commodity price (COMM) and global oil price (OP) are the exogenous variables that are included to capture the open economy status of the country. All variables are expressed in natural logarithms except the interest rate and the exchange rates.

4. The Forecast Variance Decomposition

Raghavan and Silvapulle (2008) define variance decomposition as a percentage of a shock to a specific variable that is related to either its own innovations or those associated with other dependent variables, at various forecasted time horizons in a model. It analyzes the relative importance of shocks in explaining variations among variables. Therefore, the variance decomposition in this study will help to determine the effects of monetary policy on industrial output growth in South Africa. The monthly variables are allowed to affect each other over a longer period of time. However, we simplified the monthly period into quarterly periods (at 3, 6, 9 and 12 months) for convenient and easy interpretation of the results as shown below:

4.1 The Variance Decomposition of Industrial Output (IP)

From the Table 1, the first result explains the proportion of fluctuations to a given variable caused by different shocks to industrial output. In the first quarter in column 2 ($LogIP$), the industrial output responds contemporaneously to its own shocks with 92.75% variation, while other variables explain the remaining 7.25%. Of this 7.25% variation to industrial output, the inflation rate explains 3.43%; the oil price capturing the external influence explains 2.50%, while the remaining variables do not significantly contribute to the industrial output growth in South Africa. However, after six months (second quarter), the aggregate output ($Logag$) contributes 9.99%, the inflation rate explains 4.48% and the oil price explains 3.60% to the 80.44% explained by industrial output to its own variation. In addition, the aggregate output, exchange rate, inflation rate, money supply, and oil price appear to be playing an important role in explaining much of the variation in the industrial output growth in the third and fourth quarters, respectively, after a 12-month period. Therefore, the total analysis shows that $LogIP$ (response to its own variation), $LogIF$ and $LogOP$ significantly respond to variations in industrial output growth for the entire periods ($Q1 - Q4$) while $LogCOMM$ and IN were insignificant for the entire periods. $LogMS$ and EX were insignificant in the first and second periods but their variations to IP turned significant in the third and fourth quarters, respectively. Also, $LogAG$ responds insignificantly to IP in the first quarter but it responded significantly in the other periods $(Q2 - Q4)$.

Table 1. Variance decomposition of IP

Period	S.E.	LogIP	LogAG	EX	LogIF	IN	LogMS	LogCOMM	LogOP
3	0.01617	92.7474	0.45558	0.46516	3.42881	0.05952	0.19248	0.15053	2.50045
6	0.01805	80.4366	9.98462	0.56124	4.47828	0.07113	0.19860	0.67401	3.59545
9	0.01983	69.4833	19.8501	1.31750	3.72541	0.24753	1.55794	0.68595	3.13214
12	0.02131	62.7563	23.2390	2.04018	3.31618	0.49512	4.81920	0.60892	2.72504

4.2 The Variance Decomposition of Aggregate Output (AG)

Industrial output shows 55.32% in explaining the variation in aggregate output, while for aggregate output, its own shocks shows 41.65% in the first quarter. The inflation rate only shows 1.20% as other variables do not contribute significantly to the variation in aggregate output. However, money supply and interest rates contribute significantly with 3.05% and 2.09% in the second quarter. Also, in the third quarter, industrial output contributes 27.60%. The aggregate output contributes 59.18% to its own lagged value (variation), the exchange rate contributes 1.19%, interest rate contributes 2.83% and money supply contributes 7.49%, totaling 98.29%, while other variables remain insignificant to the variations in aggregate output. However, in the fourth quarter, money supply shows 13.64%, the interest rate shows a 3.40% variation, exchange rate shows 3.28%, the industrial output shows 19.80% to the significant variation in aggregate output, and the aggregate output shows 58.35% to its own variation. Consequently, the total analyses of each variable response to aggregate output shows that $LogIP$ significantly contributes to the variation in aggregate output for all quarters while $LogOP$ and $LogCOMM$ are insignificant. $LogMS$ and IN can be summed to show 75% (Q2-Q4) variations in explaining aggregate output while EX shows 50% (Q3-Q4) variations and $LogIF$ shows 25% (only in Q1).

Table 2. Variance decomposition of AG

Period	S.E.	LogIP	LogAG	EX	LogIF	IN	LogMS	LogCOMM	LogOP
3	0.00620	55.3178	41.6485	0.47651	1.19655	0.82465	0.14525	0.10881	0.28193
6	0.00866	35.6184	57.1509	0.63971	0.83452	2.08741	3.05377	0.21764	0.39765
9	0.01104	27.6004	59.1747	1.18598	0.82142	2.83294	7.48554	0.36012	0.53896
12	0.01321	19.7960	58.3518	3.27945	0.58628	3.40139	13.6364	0.41382	0.53493

5. The $SVAR$ Forecasting of Variables

The time series data used in a model is forecasted to determine the predictive power and accuracy of the structural VAR in an econometrics model. Following the graphical approach of Harvey (1989) and Batten and Thornton (1983), the out-of-sample forecasting is employed to show the different trend types that include seasonal components, trend components and irregular components. In the forecasting process, this study is largely based on the view of Diebold and Li, (2006, p. 253) to develop a regression model using time series data from 1994:01-2010:12 to estimate the model and sample data from 2011:01-2013:12 for the ex-post (all data have been identified) static and dynamic forecasting. The "root mean-squared error" serves as the benchmark for the evaluation of the forecasting value and the actual value (see Harvey, 1989; Clarida et al., 2003). The lower the root mean-squared error (value), the smaller the error margin line (gap between the actual value and the forecasted value), hence the more satisfactory the predictive power of the model. In contrast, the greater or the bigger the value of the root mean-squared error, the wider the gap between the actual value and the forecasted value and the lesser the satisfactory power of the model. The forecasting process further presented a line graph (figure) obtained with the use of the Eviews software and by a scientific method of Pair-wise correlation coefficient matrix (pwcorr) using STATA software. This method assists the study in verifying the true movement and correlation existence between the actual variable (value) and the forecasted variable in order to substantiate and confirm the predictive power of the model for policy recommendation. The detailed results obtained from the $pwcorr$ are shown in Appendix 2 and Appendix 3, respectively.

6. Static versus Dynamic Forecasting

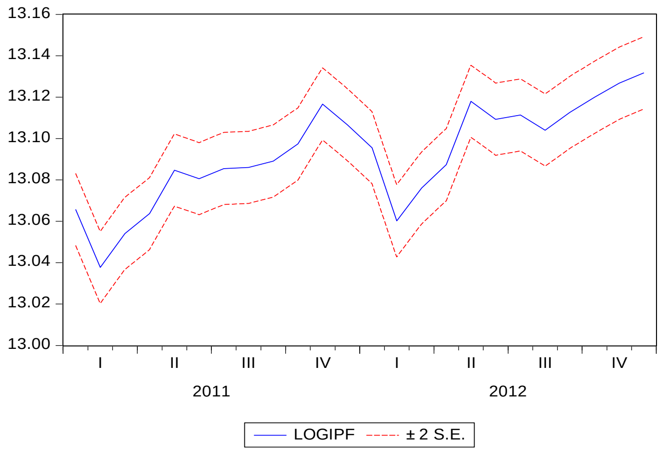
In this study, combined forecasting is carried out to distinguish between the static and dynamic approaches using the root mean-squared error as the benchmark. The combined forecasting technique was first introduced by Bates and Granger in 1969 and has since been applied by many researchers with the belief that it can improve predictive accuracy (see Clemen, 1989; Armstrong, 1989).

In general, static forecasting (simulation modelling) is based on current exposures and assumes a constant balance with no new growth. It uses actual rather than forecasted values (it can only be used when actual data are available). Conversely, dynamic forecasting relies on detailed assumptions regarding changes (increases or decreases) within the economy. It uses the previously forecasted values of the lagged variable. According to Menezes et al. (2000), reviewing both methods will lead to distinct preferences. In addition, Hibon and Evgeniou (2005) argue that the advantage of combined forecasts is not that the best possible combinations perform better than the possible individual forecasts, but that it is less risky, in practice, to combine forecasts than to select individual forecasting methods. The analysis of static and dynamic forecasting in this study will offer researchers the opportunity to choose from the two forecasting methods and select the most accurate or predictive approach that would provide useful information about future events.

6.1 The Static and Dynamic Forecasting of Industrial Sector Performance (IP)

The data estimates for industrial sector performance as an endogenous variable in the regression model ranges from 1994:01 to 2010:12. Figures 1a and 1c show the out-of-sample forecasting error for static and dynamic forecasting. In Figure 1a, the forecasting horizon is from 2011:01-2013:12 as the two red lines show a 95% confidence interval between the two (± 2) standard deviation error lines. The movement of $logipf$ within the confidence interval shows that the forecasting model is satisfactory as this is further confirmed by the lower value of 0.011209 as the root-mean squared error. Figure 1b illustrates the line figure to show the movement of $logip\ and\ logipf$ for the static forecasting.

There was a co-movement in the actual and the forecasted values of industrial output (IP) for the forecast period. This is further confirmed by the $pwcorr$. It shows a strong positive correlation of about 94% between the actual and the forecasted value of the industrial sector's performance. Furthermore, the dynamic forecasting figures also have a lower root mean-squared error of 0.029469 and satisfactory predictive power as shown in Figure 1c and confirmed by the line Figure 1d for the co-movements of the actual and forecasted value of the industrial sector performance (output). The $pwcorr$ equally shows that a strong positive relationship (75%) exists between $logip$ and $logipf$.



Forecast: LOGIPF	
Actual: LOGIP	
Forecast sample: 2011M01 2012M12	
Included observations: 24	
Root Mean Squared Error	0.011209
Mean Absolute Error	0.008173
Mean Abs. Percent Error	0.062492
Theil Inequality Coefficient	0.000428
Bias Proportion	0.301390
Variance Proportion	0.085656
Covariance Proportion	0.612954

Figure 1a. Static forecasting for LogIP

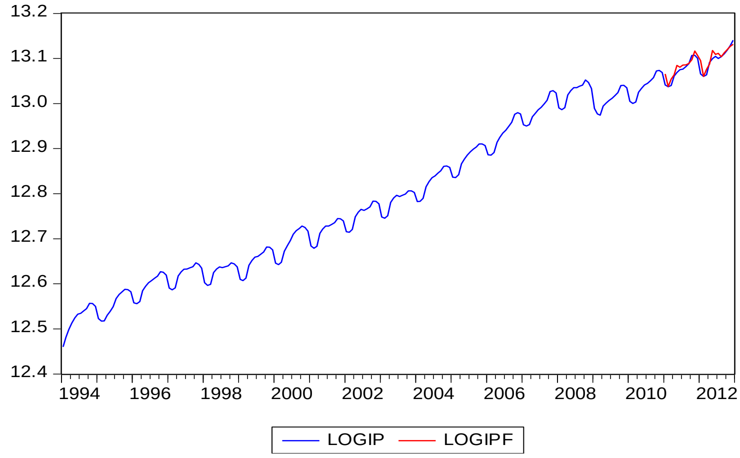


Figure 1b. Static line for LogIP

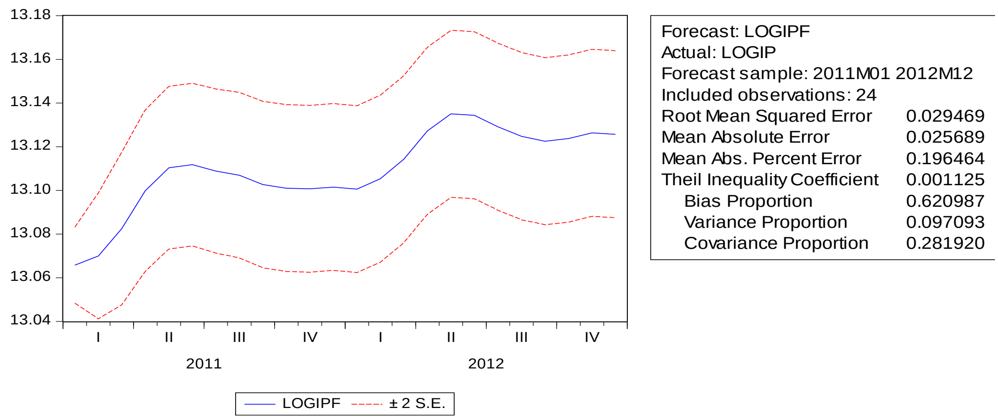


Figure 1c. Dynamic forecasting for LogIP

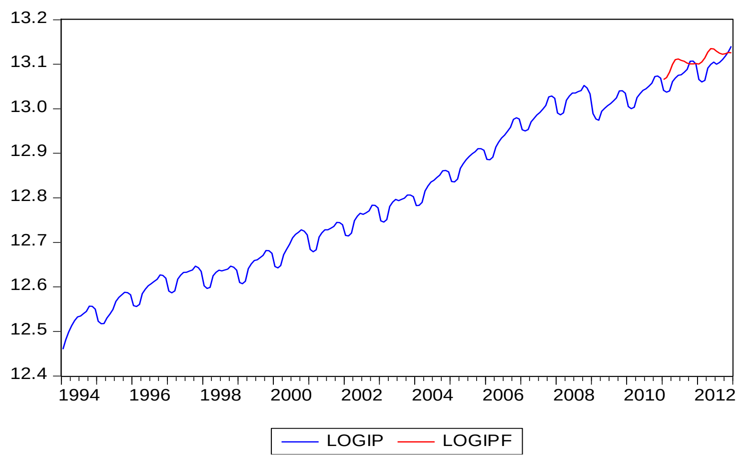


Figure 1d. Dynamic line for LogIP

6.2 The Static and Dynamic Forecasting of Aggregate Output (AG)

According to Figure 2a, the actual value of aggregate output and the forecasted value obtained from the static forecasting drifts together within the 95% confident interval. This equally shows the predictive and satisfactory power of the model, which is confirmed by the smaller value of the root-mean squared error of 0.003661. The movement is further substantiated in Figure 2b using the line and symbol figure. The $logag$ and $logagf$ move together throughout the forecasting horizon and thus further confirms the satisfactory and predictive ability of the model utilized with a very strong positive correlation of 97% as indicated by the $pwcorr$.

On the other hand, the dynamic forecast has a root mean-squared error of 0.020323, which also indicates a satisfactory and predictive power for the model. Figures 2c and 2d show the movements of the actual and forecasted values of aggregate output and this has a strong positive correlation of 83% as shown by $pwcorr$.

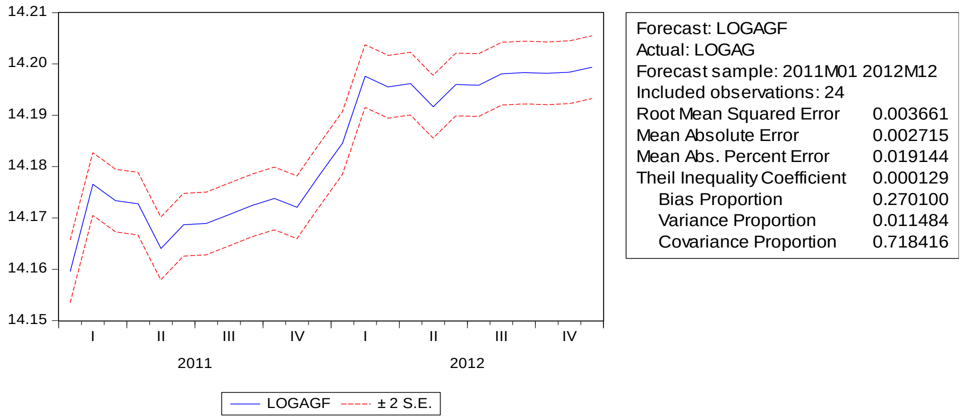


Figure 2a. Static forecasting for LogAG

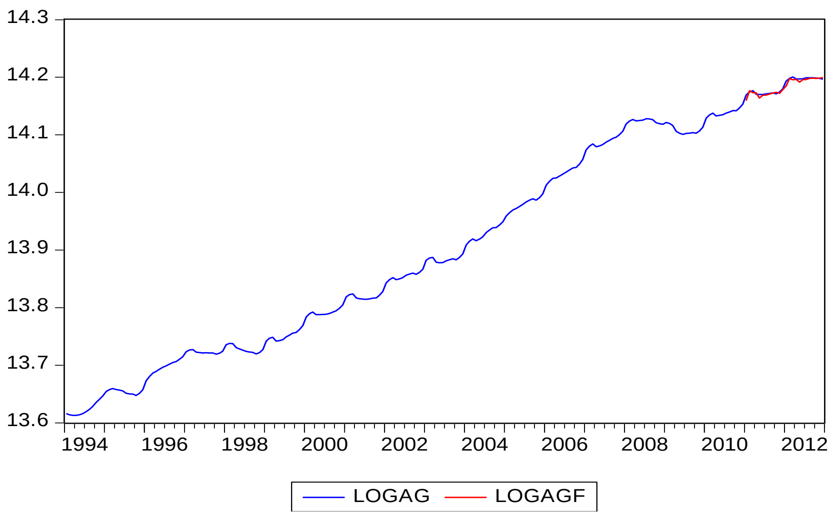


Figure 2b. Static line for LogAG

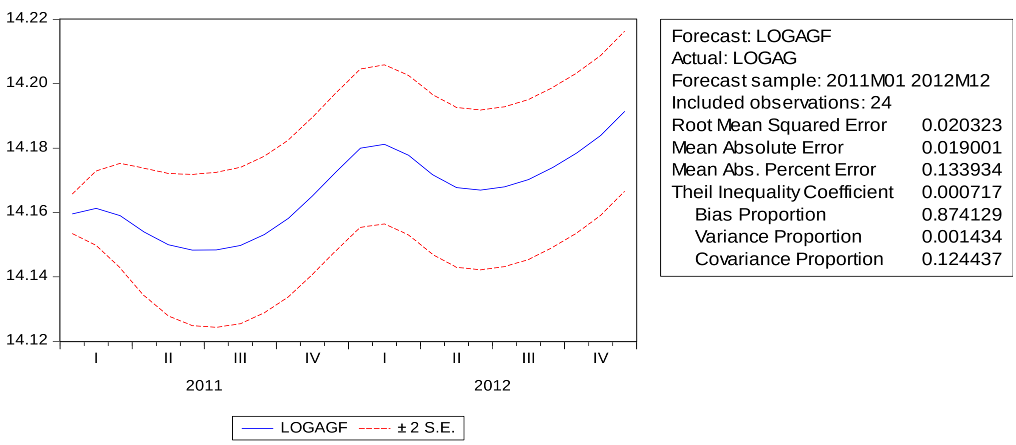


Figure 2c. Dynamic forecasting for LogAG

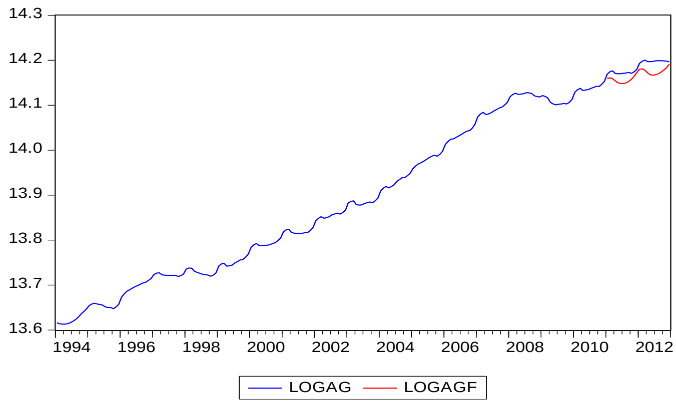


Figure 2d. Dynamic line for LogAG

6.3 The Static and Dynamic Forecasting of the Exchange Rate (EX)

The exchange rate as a policy variable also gives a good result. The predictive ability of the model is quite satisfactory with a root-mean squared error of 0.245802. Although, the value of the root-square mean is a bit higher and far from zero due to instability in the external value of the exchange rate system in the global market and the current depreciation of the external value of the Rand exchange rate. The predictive ability of the model used in this study was still satisfactory and can account for both variations in the domestic and external value of the currency (exchange rate system) as shown in Figure 3a. The satisfactory predictive power of the model is further confirmed in Figure 3b. The exchange rate and exchange rate forecast (ex and exf) move together in the same direction and the $pwcorr$ shows a 94% positive correlation between the actual value of the exchange rate and the forecasted value. However, the dynamic forecasting brought out the likely changes (increase or decrease) in the economy. The root mean-squared error was very high and far from zero (1.901262) as shown in Figure 3c. This is further confirmed in Figure 3d. The $pwcorr$ shows a strong negative correlation of 87% between ex and exf.

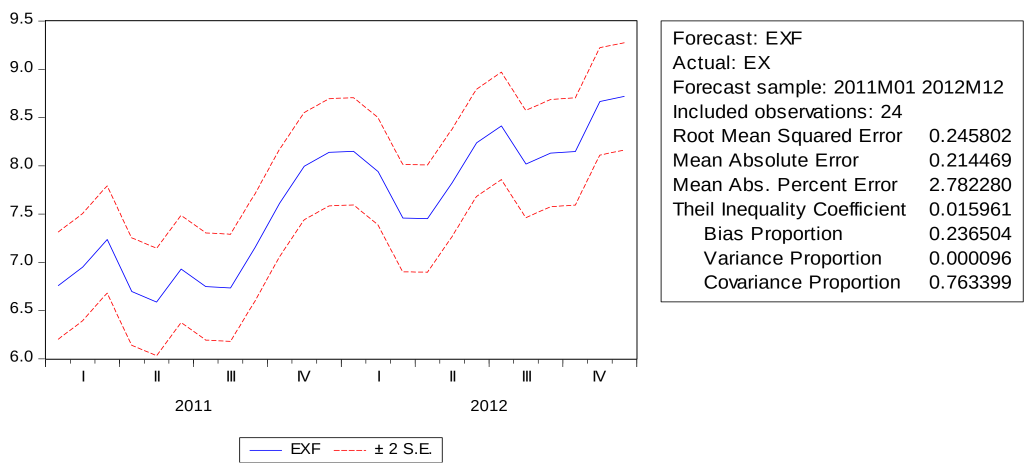


Figure 3a. Static forecasting for EX

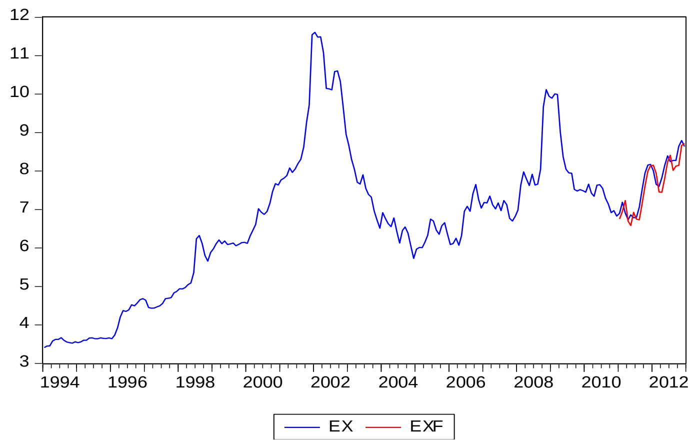


Figure 3b. Static line for EX

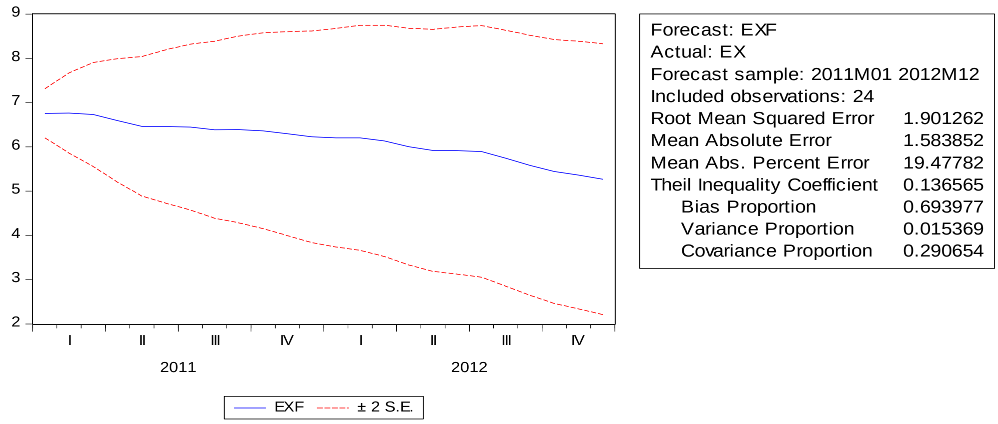


Figure 3c. Dynamic forecasting for EX

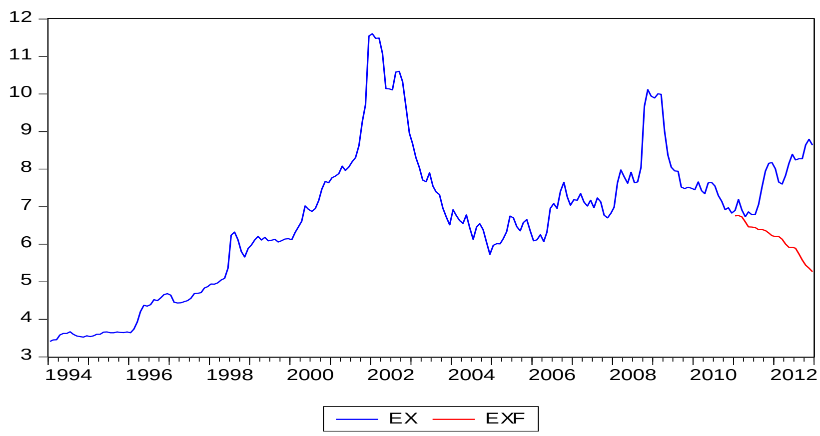


Figure 3d. Dynamic line for EX

6.4 The Static and Dynamic Forecasting of the Inflation Rate (IF)

The CPI is the proxy to capture the actual value of the $logif$ for data estimates in the $SVAR$ model. Figure 4a shows the movement of the $logiff$ along the 95% confidence interval. There is a close movement between the $logif$ and $logiff$, which indicates that there is a satisfactory forecasting ability of the model as confirmed by the lower value of the root-mean squared error of 0.004549. In addition, Figure 4b shows a clear picture to re-affirm the predictive ability of the model and to confirm the strong positive correlation of 99%. This shows that the actual value of the inflation rate and the forecasted value move closely together. The dynamic forecasting has its root mean-squared error of 0.042398 as shown in Figure 4c. The line Figure 4d shows the co-movements between $logif$ and $logiff$ with 97% strong Pair-wise correlation coefficients ($pwcorr$).

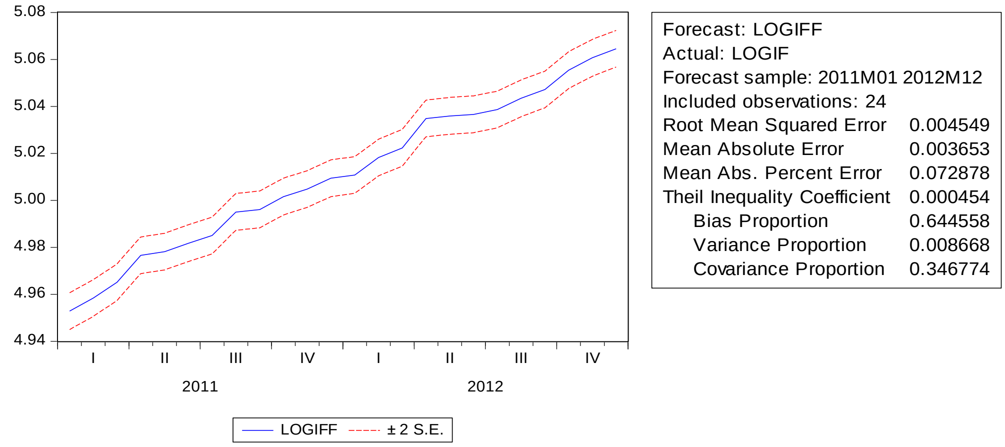


Figure 4a. Static frecasting for LogIF

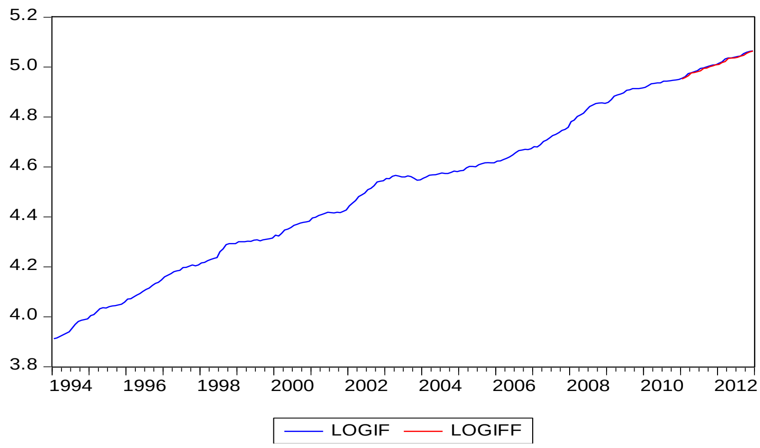


Figure 4b. Static line for LogIF

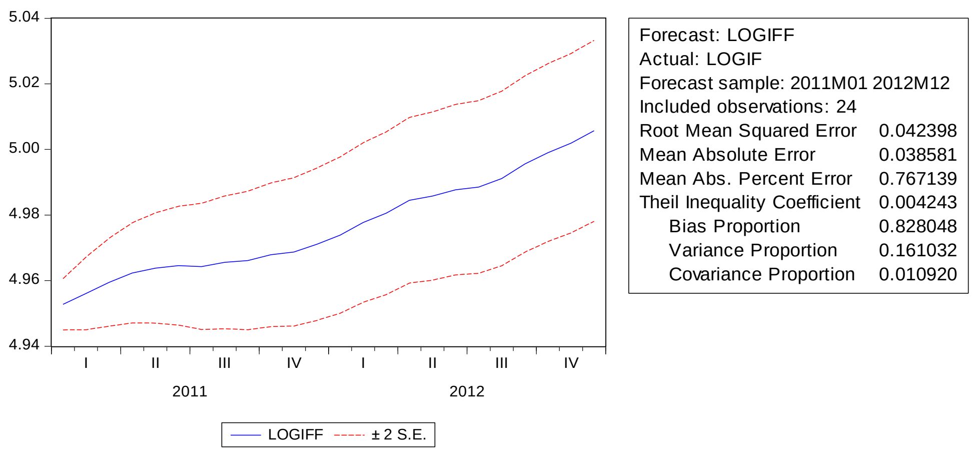


Figure 4c. Dynamic forecasting for LogIF

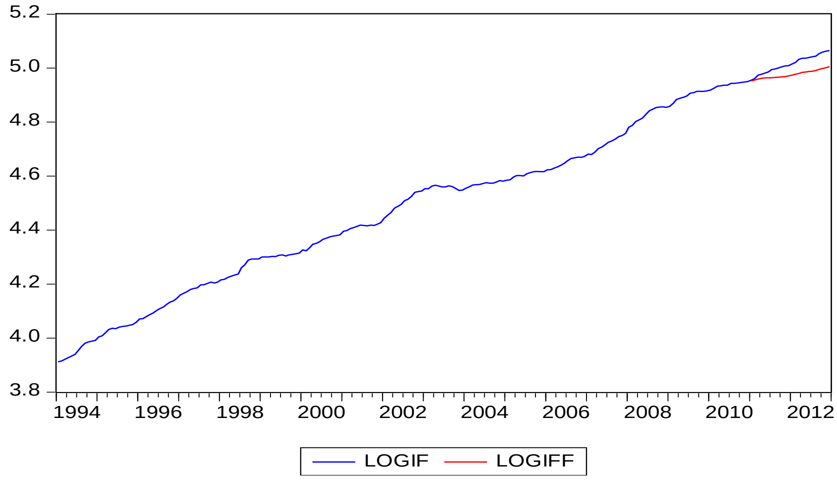
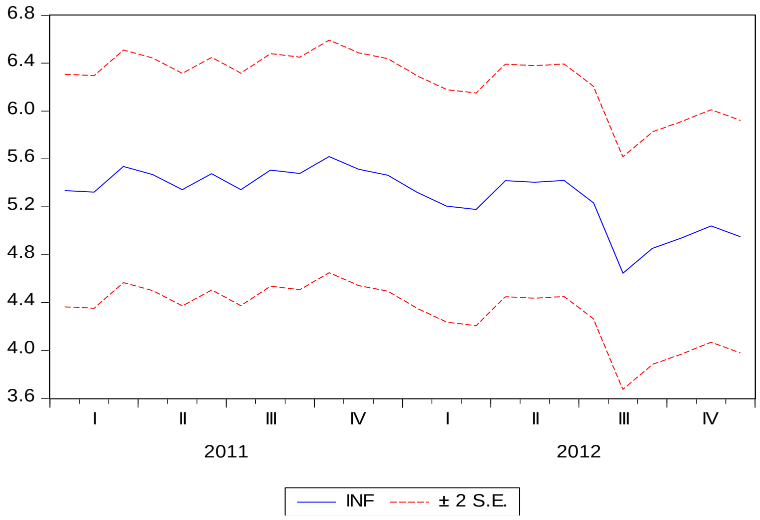


Figure 4d. Dynamic line for LogIF

6.5 The Static and Dynamic Forecasting of the Interest Rate (IN)

The frequent changes in the interest rate as a policy variable to control inflation in the economy give the root mean-squared a high value. The out-of-sample static forecasting model is nonetheless satisfactory in determining the movement of the actual and the forecasted values of the interest rate in the economy for the forecast horizon. IN and INF move together within the two standard deviation error lines as confirmed by the value of the root-mean squared error of 0.155570 as shown in Figure 5a. This means that the predictive ability of the model for the actual value and the forecasted value for the interest rate is satisfactory and can guarantee that the future rate can be set by the Reserve Bank within the economy. Figure 5b shows the co-movements of the variables and further confirms the ability of the model to predict the interest rate in the economy with a strong ($pwcorr$) positive correlation of 83%. However, the dynamic forecasting has a high root mean-squared error of 1.168728 as shown in Figure 5c and is thus capable of identifying the likely changes in the interest rate. Figure 5d shows the movement of in and inf. The $pwcorr$ shows a strong positive relationship of 84% between the actual value and the forecasted value of the interest rate in the economy.



Forecast: INF
Actual: IN
Forecast sample: 2011M01 2012M12
Included observations: 24

Root Mean Squared Error	0.155570
Mean Absolute Error	0.120066
Mean Abs. Percent Error	2.249934
Theil Inequality Coefficient	0.014570
Bias Proportion	0.281845
Variance Proportion	0.023541
Covariance Proportion	0.694613

Figure 5a. Static forecasting for IN

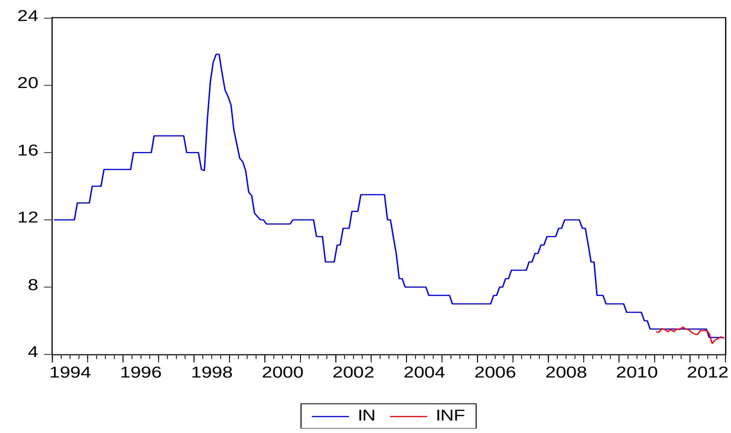


Figure 5b. Static line for IN

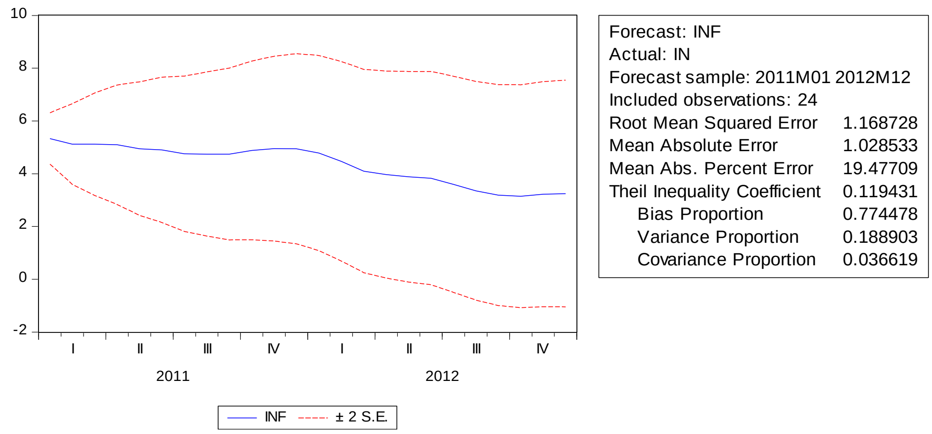


Figure 5c. Dynamic forecasting for IN

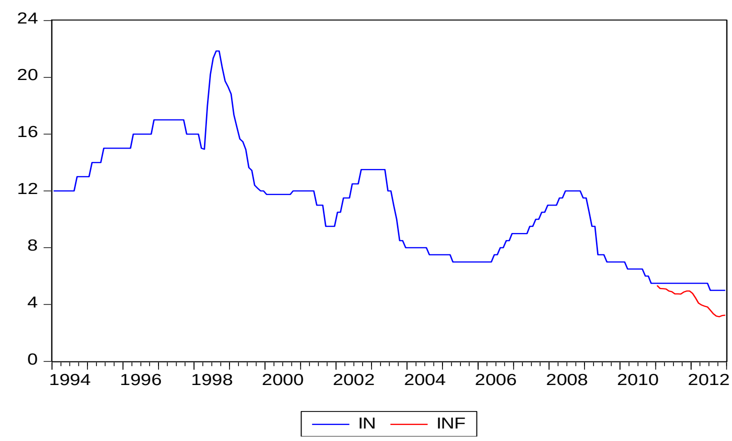


Figure 5d. Dynamic line for IN

6.6 The Static and Dynamic Forecasting of Money Supply (MS)

The forecasting power of money supply in the model is satisfactory as the actual value and predicted values move closely together. As illustrated in Figure 6a, the $logms$ and $logmsf$ move very close to each other along the two standard deviation error lines and this is further established by the small value of the root-mean squared error of 0.018489. Figure 6b shows the movements of $logms$ and $logmsf$ for the entire forecasting period with a 95%

strong positive relationship. On the other hand, the dynamic forecasting has a root mean-squared error of 0.093869 as shown in Figure 6c, hence the good predictive ability of the model. The line figure 6d shows the movements of the variables ($logms$ and $logmsf$). In addition, the $pwcorr$ shows a strong positive correlation of 95% between the actual and forecasted value of money supplies.

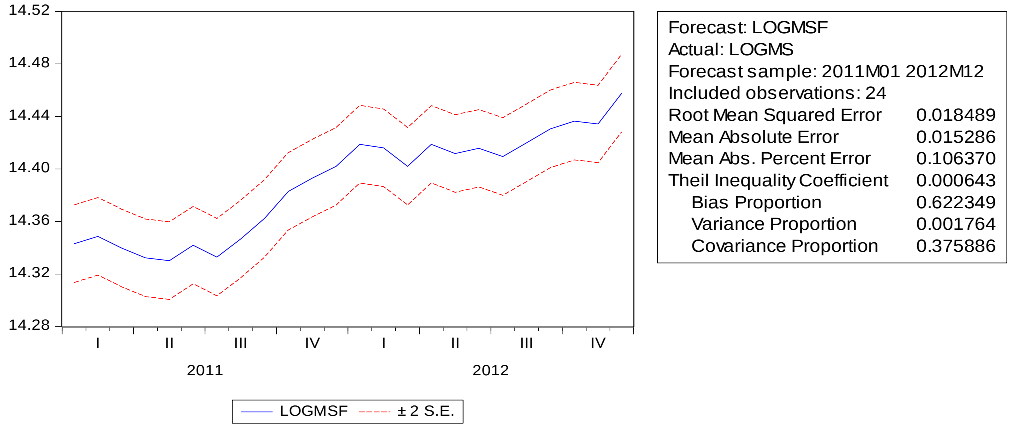


Figure 6a. Static forecasting for LogMS

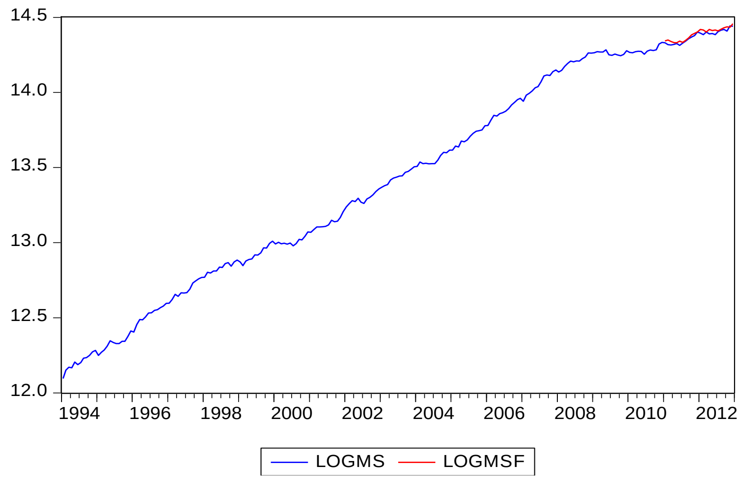


Figure 6b. Static line for LogMS

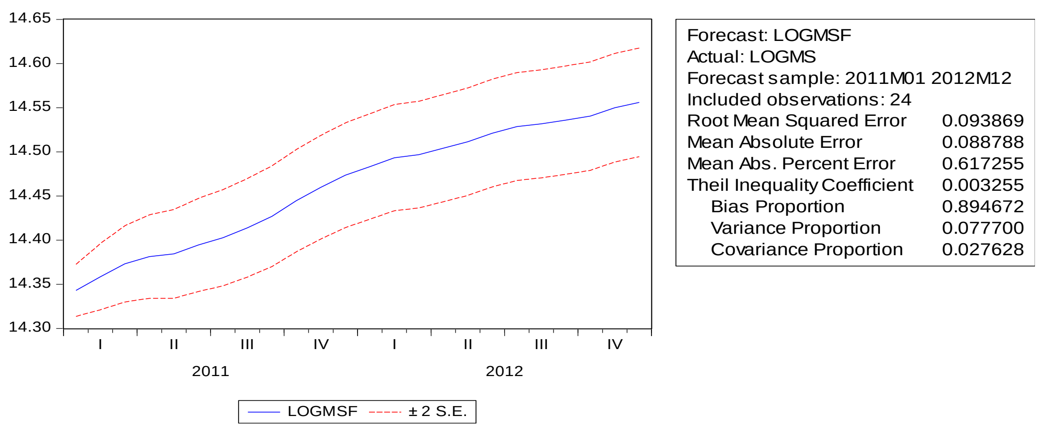


Figure 6c. Dynamic forecasting for LogMS

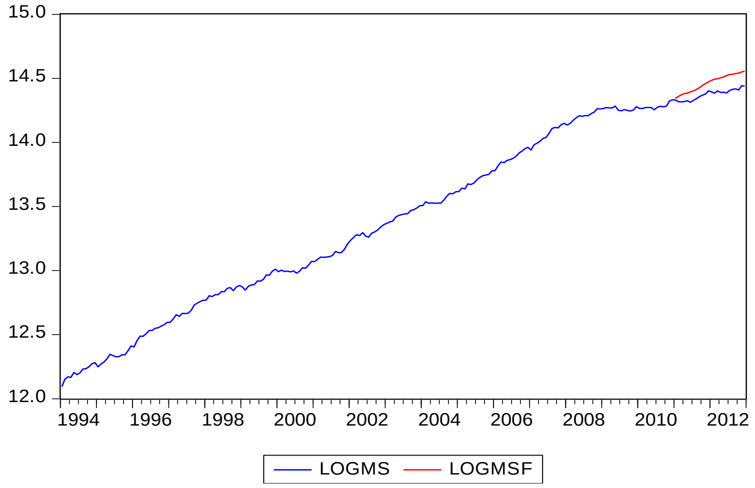


Figure 6d. Dynamic line for LogMS

6.7 The Static and Dynamic Forecasting of Commodity Prices (COMM)

This is the commodity price captured by South Africa's main exports and it represents an external variable that is shock responsive and that has an impact on the domestic variables. Based on the results obtained in Figure 7a, the $logcommf$ moves very closely within the two standard deviation error lines with a lower root mean-squared error of 0.010966, while Figure 7b shows the co-movements of the $logcomm$ and $logcommf$ for the whole static forecasting horizon. The benchmark for the forecasting confirms the satisfactory power of the model to predict future commodity prices. The $pwcorr$ also confirms a strong correlation of 92% between the actual value of commodity prices and the forecasted value. Furthermore, the dynamic forecasting has a root mean-squared error of 0.039149 as indicated in Figure 7c and the co-movements of $logcomm$ and $logcommf$ are shown in Figure 7d. The movements also show the satisfactory power of the model with $pwcorr$ coefficients of 51%.

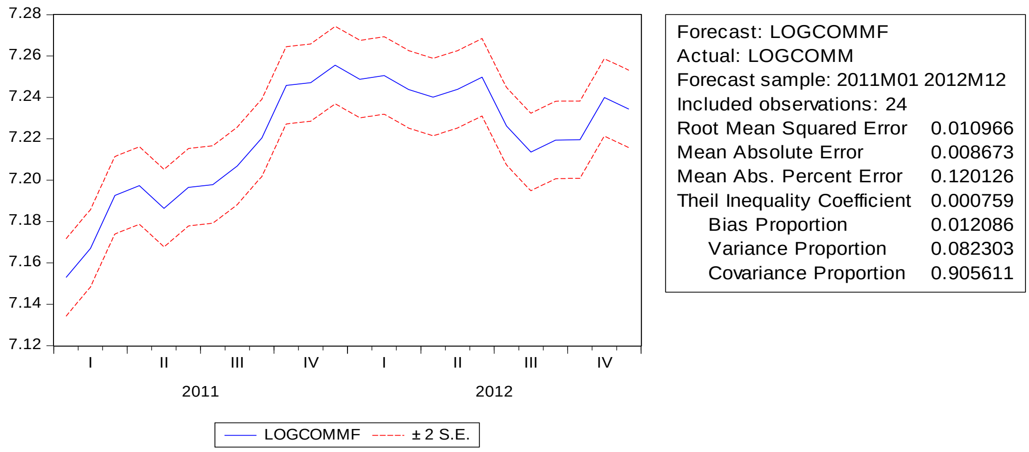


Figure 7a. Static forecasting for LogCOMM

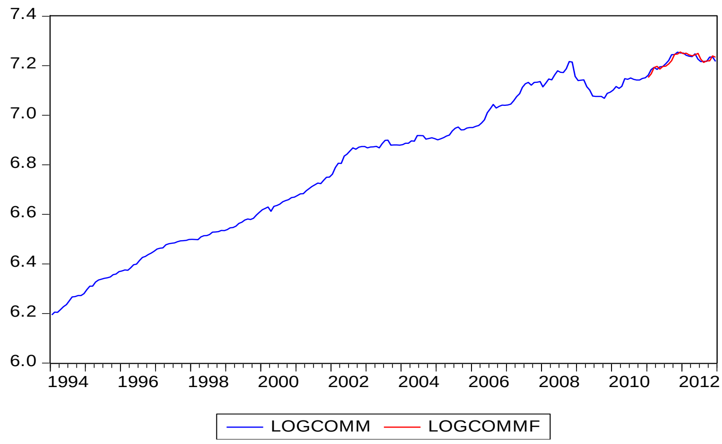


Figure 7b. Static line for LogCOMM

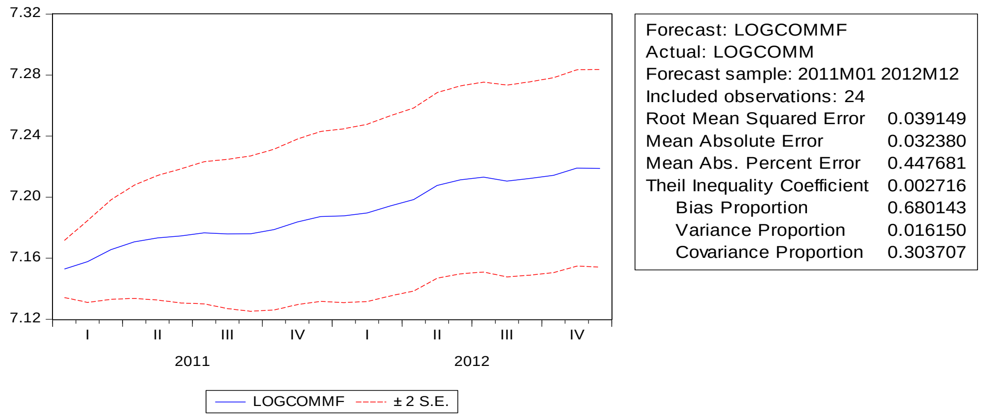


Figure 7c. Dynamic forecasting for LogCOMM

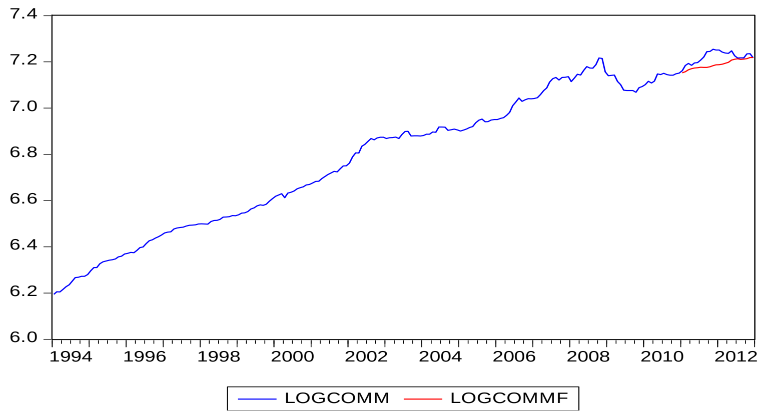


Figure 7d. Dynamic line for LogCOMM

6.8 The Static and Dynamic Forecasting of Oil Prices (LogOP)

The oil price also captures the external shock from the global market that persistently affects domestic prices due to its spillover effects. An increase in the price of oil also leads to an increase in domestic prices. In the results presented, by estimating the model the figures show up-spring and down-spring movements of the actual and forecasted values. In Figure 8a, the $logopf$ moves within the two standard deviation error lines within the 95% confidence interval. The low root mean-squared error of 0.052861 shows the predictive power of the model to be satisfactory. Furthermore, Figure 8b shows that $logcomm$ and $logcommf$ are moving closely together for the forecasting periods with a strong positive correlation of 69%. Moreover, the dynamic forecasting has a root mean-squared error of 0.098685 as shown in Figure 8c and by the covariance of the variables in Figure 8d, the actual value of the oil price and the forecasted value drifts together. However, the $pwcorr$ shows a weak negative relationship of -0.1243 between $logop$ and $logopf$. This conforms to the literature, that dynamic forecasting facilitates the generation of changes (increases or decreases) within the economy and provides small forecasting improvements compared to static forecasting (see details in Schumacher & Breitung, 2008).

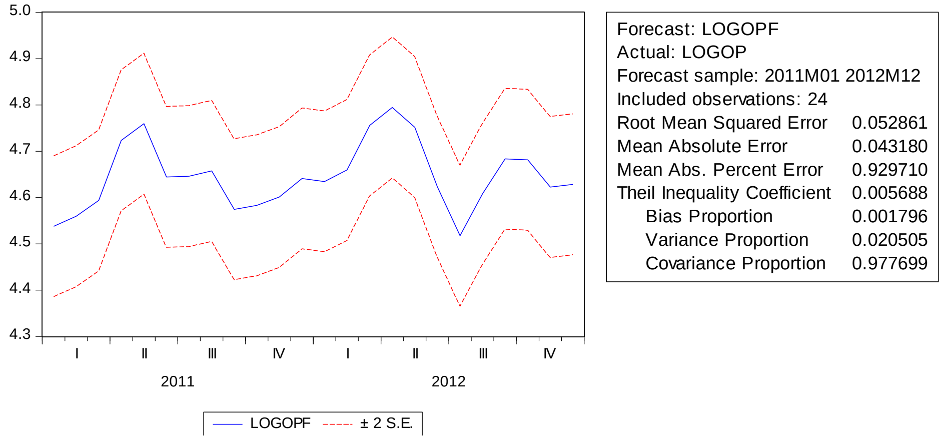


Figure 8a. Static forecasting for LogOP

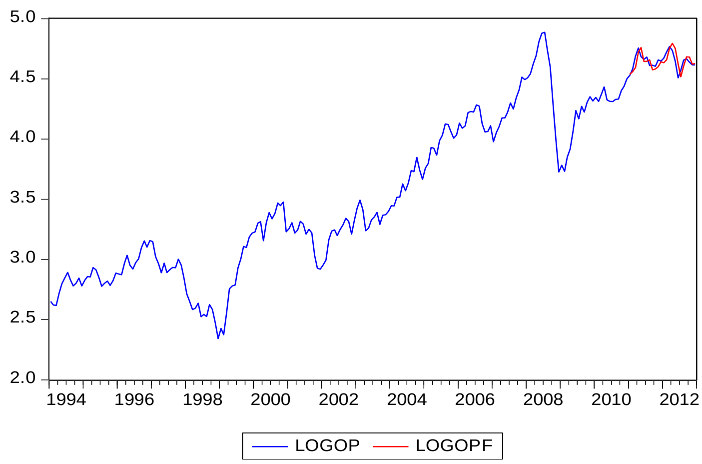


Figure 8b. Static line for LogOP

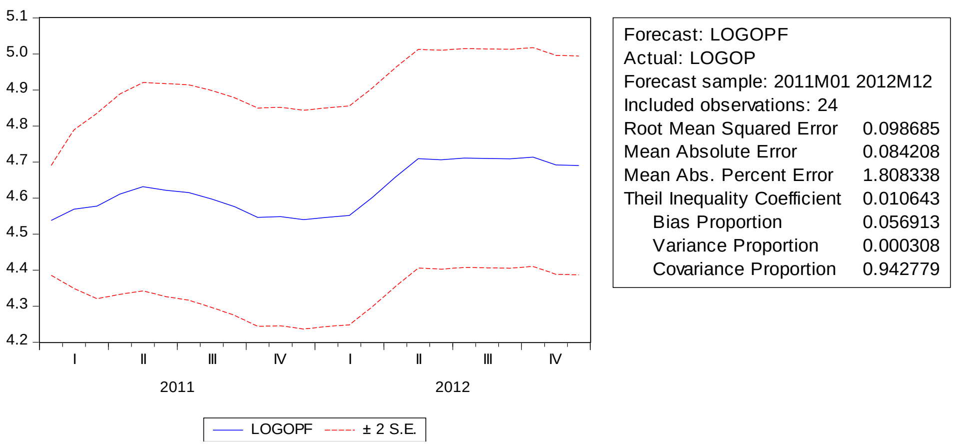


Figure 8c. Dynamic forecasting for LogOP

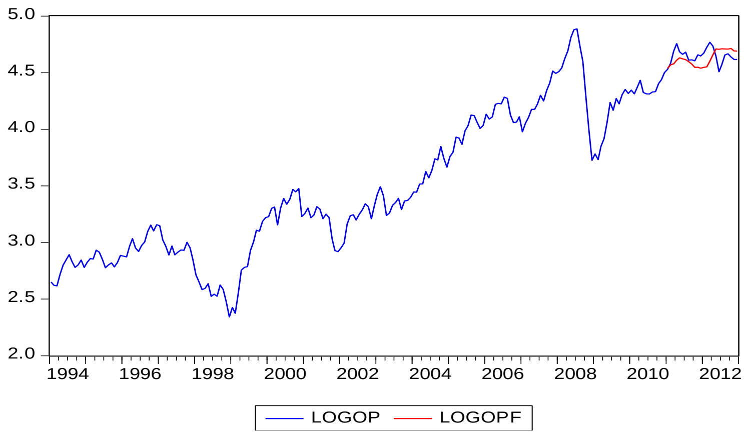


Figure 8d. Dynamic line for LogOP

7. Conclusions

The main aim of this study is to examine the impact of monetary policy shocks on output growth in South Africa and also forecast the predictive power of the model in assisting monetary authorities to cope with uncertainties in the future. After estimating the $SVAR$ equation, the estimated model passes through structural imposition of restrictions, the variance decomposition analyses and several forecasting processes in order to forecast and predict South African data to achieve the objectives of the study.

The results from the variance decompositions of the macroeconomic variables are presented in Table 1 and Table 2. The results show that the interest rate and the commodity prices are the only variables found to be insignificant in explaining the variations in industrial output for all the months (Q1-Q4). The impacts of an unexpected change in the South African monetary policy on output (both industrial output and aggregate output) show a temporary impact of an upward and downward spring of monetary variables and global oil price shocks to the economy. The exchange rate, inflation and money are found to significantly impact output growth in the long run as well as the global oil price. The impact of interest rates to changes in industrial production remains below 1% in all periods. This may indicate that industrial producers in South Africa are not constrained by the cost of credit in their production of goods and services. Nonetheless, since oil price shock has an impact on economic activities and could negatively affect output growth, the policy recommendation suggests a continuous diversification of the economy and also that the monetary policy action should factor in the leading indicators of global prices and economic activity, taking into account the various channels, especially the exchange rate, for the forecast horizon (period).

Finally, the analysis from static and dynamic $SVAR$ forecasting shows the analysis of trends in order to direct future trends and to direct policy response to stimulate output growth. Dynamic forecasting has a more robust result than static forecasting. It clearly brings out the growth patterns (increase and decrease) and can be justified and recommended to policymakers in calculating or in predicting the outcome of monetary policy actions for future development. However, the implication of the recommendation for the use of dynamic forecasting is the associated risk and uncertainty that might be central to its prediction, it's expected reliability and attributes (see Sohn, 1997), which are essential to its success and failure. Therefore, it will generally be a good practice if a combined (static and dynamic) forecasting technique is employed in order to compare and validate the degree of uncertainty attached to the model when forecasters are uncertain about the situation, uncertain about which method is most accurate, avoid large errors and draw from different sources of information in an attempt to stimulate output growth in the economy.

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Appendix 1

Results of Variance Decomposition of all the Variables

Table 1. Variance decomposition of logIP

Period	S.E.	LogIP	LogAG	EX	LogIF	IN	LogMS	LogCOMM	LogOP
1	0.008875	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.013963	96.78180	0.030355	0.244777	1.726532	0.045114	0.197805	0.036831	0.936790
3	0.016178	92.74746	0.455585	0.465166	3.428809	0.059522	0.192477	0.150533	2.500449
4	0.016785	88.39537	2.185483	0.529521	4.619696	0.060791	0.181627	0.351888	3.675628
5	0.017267	84.26276	5.692285	0.500922	4.843747	0.058531	0.173973	0.559361	3.908424
6	0.018055	80.43667	9.984623	0.561241	4.478277	0.071127	0.198603	0.674008	3.595451
7	0.018817	76.57377	14.00705	0.765910	4.125327	0.109127	0.370419	0.706871	3.341532
8	0.019370	72.76509	17.36960	1.044421	3.904242	0.170862	0.811455	0.704047	3.230283
9	0.019830	69.48337	19.85015	1.317502	3.725407	0.247533	1.557938	0.685951	3.132143
10	0.020322	66.92833	21.43946	1.554027	3.557875	0.329092	2.535319	0.659643	2.996248
11	0.020836	64.81180	22.45167	1.778640	3.422034	0.411189	3.640432	0.632243	2.851993
12	0.021319	62.75630	23.23905	2.040187	3.316175	0.495122	4.819203	0.608923	2.725039

Table 2. Variance decomposition of logAG

Period	S.E.	LogIP	LogAG	EX	LogIF	IN	LogMS	LogCOMM	LogOP
1	0.003085	77.48383	22.51617	4.88E-27	1.45E-32	1.74E-30	5.62E-28	1.05E-29	4.58E-29
2	0.005058	67.59600	30.76214	0.233060	0.788784	0.394393	0.004059	0.058007	0.163556
3	0.006198	55.31778	41.64852	0.476512	1.196554	0.824647	0.145252	0.108812	0.281926
4	0.006949	44.11716	51.60564	0.627367	1.161870	1.341528	0.756394	0.150134	0.239899
5	0.007750	38.00727	56.37699	0.654785	0.934512	1.780316	1.817465	0.183258	0.245403
6	0.008655	35.61838	57.15093	0.639709	0.834515	2.087411	3.053767	0.217635	0.397649
7	0.009528	33.59041	57.34906	0.677145	0.855914	2.339638	4.372244	0.262062	0.553527
8	0.010310	30.78635	58.17517	0.840124	0.869218	2.588930	5.832682	0.313409	0.594125
9	0.011036	27.60037	59.17467	1.185978	0.821423	2.832936	7.485542	0.360122	0.538960
10	0.011753	24.57400	59.68210	1.733694	0.737539	3.054348	9.346160	0.392526	0.479639
11	0.012476	21.94962	59.40347	2.451849	0.654584	3.244352	11.40893	0.408955	0.478249
12	0.013206	19.79598	58.35179	3.279454	0.586282	3.401386	13.63636	0.413820	0.534933

Appendix 2

Detail Results of Static Forecasting of Variables

```
. pwcorr logip logipf
             |    logip    logipf
-------------+------------------
       logip | 1.0000
      logipf | 0.9410    1.0000

. pwcorr logag logagf
             |    logag    logagf
-------------+------------------
       logag |1.0000
      logagf | 0.9716    1.0000

. pwcorr ex exf
             | ex         exf
-------------+------------------
          ex |1.0000
         exf|0.9470     1.0000

. pwcorr logif logiff
             | logif        logiff
-------------+------------------
       logif |1.0000
      logiff|0.9965     1.0000

. pwcorr in inf
             |   in          inf
-------------+------------------
          In| 1.0000
         Inf| 0.8385    1.0000

. pwcorr logms logmsf
             |logms       logmsf
-------------+------------------
       logms |1.0000
      logmsf |0.9591     1.0000

. pwcorr logcomm logcommf
             | logcomm logcommf
-------------+------------------
     logcomm |1.0000
logcommf | 0.9201     1.0000
```

```
. pwcorr logop logopf
             | logop      logopf
-------------+------------------
       logop |1.0000
      logopf |0.6931      1.0000
```

Appendix 3

Detail Results of Dynamic Forecasting of Variables

```
. pwcorr logip logipf
             | logip       logipf
-------------+------------------
       logip | 1.0000
      logipf | 0.7509      1.0000

. pwcorr logag logagf
             | logag      logagf
-------------+------------------
       logag |1.0000
      logagf |0.8337      1.0000

. pwcorr ex exf
             | ex            exf
-------------+------------------
          ex | 1.0000
         exf |-0.8704      1.0000

. pwcorr logif logiff
             |logif        logiff
-------------+------------------
       logif |1.0000
      logiff |0.9794      1.0000

. pwcorr in inf
             | in            inf
-------------+------------------
          In|1.0000
         Inf|0.8406      1.0000

. pwcorr logms logmsf
             | logms      logmsf
-------------+------------------
       logms |1.0000
      logmsf |0.9540      1.0000
```

```
. pwcorr logcomm logcommf
             | logcomm logcommf
-------------+------------------
Logcomm|1.0000
logcommf|0.5171      1.0000
```

```
. pwcorr logop logopf
             |logop      logopf
-------------+------------------
     logop |1.0000
   logopf |-0.1243      1.0000
```

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Political Risks and Their Economic Effects: Evidence from Egypt

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Abstract

This research aims at studying the effect of political changes on Egyptian economy by studying the direct and indirect effect of political risk index and its sub-indicators on number of important variables such as economic growth, employment, exchange rates, Egyptian Exchange main index (EGX30), foreign investment flows, domestic interest rates, and domestic public debt during the time period from 2006 to 2015 using parametric and nonparametric statistical methods. The study concluded that political risk index and its sub-indicators have had varying effects on financial and real investment and other macroeconomic variables in Egypt; and that achieving a successful economic development process cannot be reached without taking into account determinants of political risk.

Keywords: sovereign spread, country risk, political risk index, and political risks' sub-indicators

1. Introduction

Investment decision, by itself, is not a complicated one, as once we manage to consider all aspects of costs associated with the investment decision and to estimate its expected returns, there will be no difficulty to make a proper decision regarding the proposed investment. The main problem in making any investment decision is the ability to consider all aspects of costs that the investment will expose to. Investment costs can be divided into tangible and intangible costs. Where tangible costs classified as constructional and operational costs; intangible costs include opportunity cost and risk cost. Risk, in general, is defined as all aspects of uncertainty; thus, considering intangible costs will be a relatively harder and complicated task in making any investment decision. The relationship between investment and risk has been developed to the extent that investment decision is considered a risk-return trade off scheme. There are number of models that analyze this relationship such as portfolio theory, capital market line model (Markowitz, 1952), capital assets pricing model introduced by Sharpe (1964) and developed by Lintner (1965) and Black (1972), arbitrage pricing theory (Ross, 1976), Fama and French models (Fama & French, 1995 & 2013), and other models that pursuit for risk pricing.

Uncertainty of state condition comes on top of investment risks and represents additional cost to be added to other investment costs (Liu et al., 2013). Uncertainty due to state condition is known as *sovereign spread* and it reflects the level of country risk. Political risk represents part of sovereign spread in addition to financial and economic risks (Bekaert et al., 2015). The level of political risk is determined by *political risk index*, which contains number of components in six groups or sub-indicators. The first indicator is related to *voice and accountability* and it is determined by the extent of military intervention in politics and democratic accountability; the second indicator is related to *political stability and absence of violence* and it is determined by the extent of government stability, internal and external conflicts, and ethnic and religious tensions; the third indicator is related to *government effectiveness* and it is determined by bureaucratic quality; the fourth indicator is related to *regulatory quality* and it is determined by the support provided by the government to the private sector and government intervention in the economy; the fifth indicator is related to *rule of law* and it is determined by the power of law, litigation's duration and contract enforcement; and finally the sixth indicator is related to *control of corruption* (International Country Risk Guide [ICRG] and Methodology).

Political risk, as a source of systematic risk, is considered one of the determinants of market risk premium (see: Andrade, 2009), a major determinant of domestic and foreign investment decisions and a variable that able to explain disparities of stocks' returns between different countries (Harvey, 1991), as changes in the level of political risk will be reflected on the performance of the stock market in form of fluctuations in stocks' prices, returns and their trading values and volume (Bilson et al., 2002; Dimic et al., 2015). Thus, ignore the important role of the level of political risk while preparing an international portfolio decreases the positive effect of the international diversification of the portfolio (Smimou, 2014).

While interest rates should reflect the risk (default and market risk) associated with lending activities; and, as just mentioned, political risk is part of market risk; then political risks should have their effects on domestic interest rates (Caporale & Caporale, 2008), as interests have to cover all risk premiums of lending transactions including the one that is related to changes in political status. Then, it is not surprising to notice an increase in interest rates on government securities during periods of political changes, as the level of uncertainty increases during such periods (Huang et al., 2015).

In light of political risk effects on investment decision, stock markets and domestic interest rates, that were discussed earlier, it is expected that the effects of political risk will go further and extend to affect other important economic variables such as economic growth, employment, inflation, exchange rates and domestic public debt. In short, it can be said that political risks may have their effects on macroeconomic goals and development plans.

1.1 Research Problem

Political status in Egypt has witnessed severe changes since 25th of January 2011; these changes have had their effects on investment environment in Egypt and directly affected the level of welfare of citizens. Negative effects of political changes in Egypt on investment are explicit, as these changes destroyed the main determinant of any investment decision (domestic and foreign) which is political stability and increase the level of market risk. In addition to the explicit effects of political changes on investment environment, they have had implicit effects on other important economic variables that affect the economic status of Egypt. Where the explicit effects of changes in the level of political risk on investment environment are clear and understandable, the implicit ones on other economic variables and the process of economic development as a whole are not.

1.2 Research Importance

Understanding explicit and implicit effects of political changes on the Egyptian economy enables for more accurate decisions and policies during such periods and helps to get-out quickly of such crises, as ambiguity of the impact of these political changes on the economy and unawareness of the sources of threat may aggravate the negative effects of these political changes and/or prolong the time period of these crises. Moreover, political changes represent another important variable to be added to other variables that affect financial instruments in financial markets, cost of doing business, and a variable that should be considered while setting-up economic policies and plans especially during periods of political changes, which is political risk.

1.3 Research Objective

Examining the effect of political changes in Egypt on the level of political risk of the country; analyzing the behavior of Egyptian Exchange (represented by its main index EGX30), foreign investment flows, domestic interest rates, domestic public debt, and other macroeconomic variables before, during and after 25th of January 2011 and 30th of June 2013 revolutions, in order to determine the general responsiveness of such variables to these political changes; and finally determining sources of political risk (political risks' sub-indicators) that are responsible for changes in the considered variables and their effects on the process of economic development as a whole.

1.4 Research Hypotheses

A. Political changes that have been occurred in Egypt increased the level of political risk of the country.

B. Political changes in Egypt have had significant effect on the performance of Egyptian Exchange.

C. Political changes are the main cause of the inflation of domestic public debt in Egypt.

D. Correlation of political risks' sub-indicators and their effects on different economic variables may explain the failure of the economic development process in Egypt.

1.5 Research Time Limitation

This research covers the time period from 2006 to 2015, where this time period has witnessed two revolutions in Egypt (25th of January 2011 and 30th of June 2013 revolutions).

1.6 Research Methodology

A. Graphical and Tabular Descriptive Techniques

Arranging, summarizing and presenting data by using tables and suitable graphical techniques, which enable data to produce useful information about the considered variables and make proper decisions based on the information generated.

B. Statistical Analysis

Using parametric and nonparametric statistical methods that help in analyze the effect of political risk index and its sub-indicators on different variables, determine mutual relationships between variables and measure the effect of these variables on each other.

1.7 Research Plan

Section (1): General Framework of the Research.

Section (2): Literature Review.

Section (3): Political Changes and Indicators of Political Risk in Egypt.

Section (4): Political Risk and Egyptian Exchange.

Section (5): Political Risk and Foreign Investment Flows.

Section (6): Political Risk, Domestic Interest Rates and Public Debt.

Section (7): Political Risk and Macroeconomic Goals.

Section (8): Concluding Remarks.

Section (9): Research Recommendations.

2. Literature Review

Number of studies are related directly or indirectly to the topic of this study, as there are studies that related to economic effects of political risk and economic conditions, while other studies related to other economic variables covered by this research such as interest rate structure and inflation.

2.1 Studies Related to Economic Effects of Political Risk

- Bekaert, Geert, Harvey, Campbell, Lundblad, Christian, Siegel, Stephan, "Political Risk and International Valuation", Journal of Corporate Finance, 2015.

The study found the following main results:

- Political risk reflects, on average, less than a third of the variation of sovereign spreads.
- Adjusting projects' cash flows using sovereign spread substantially overstates discount rate that reflects political risk.

- Heikki Lehkonen and Kari Heimonen, "Democracy, political risks and stock market performance", Journal of International Money and Finance 59, 2015.

The study found the following main results:

- Democracy and political risk do have impact on stock market returns especially for emerging markets.
- The relationship between democracy and political risk is parabolic, where just after a certain level of democracy political risk tends to decrease.
- Stock market returns are negatively related to the level of political risk.
- The movement of international capital flows could reinforce the impact of political turmoil on stock markets.

- Nebojsa Dimic, Vitaly Orlov and Vanja Piljak, "The political risk factor in emerging, frontier, and developed stock markets", Finance Research Letters, 15 (2015).

The study found the following main results:

- Aggregate political risk factor affects stock returns of developed, emerging and frontier markets.
- The effect of political risk's individual components differs according to market classification.
- Government action is the significant common source of political risks in all three market categories.
- For frontier and emerging markets, the main difference relates to the risk of conflict reflected in ethnic tensions.
- Government stability is the source of political risk in frontier stock markets.

- Tao Huang, Fei Wu, Jing Yu and Bohui Zhang, "International political risk and government bond pricing", Journal of Banking & Finance, 55, 2015.

The study found the following main results:

- There is a positive and significant relationship between international political risk and government bond yields.
- Yields on government bonds that are issued by countries characterized by stable political systems and strong investor protection are less affected by international political risk.

- Frankie Chau, Rataporn Deesomsak and Jun Wang, "Political uncertainty and stock market volatility in the Middle East and North African (MENA) Countries", Journal of International Financial Markets, Institutions & Money, 28, 2014.

The study found the following main results:

- Changes in the level of political risk increase the volatility of Islamic indices while their effect on the volatility in conventional markets is insignificant.
- The effect of political changes on the integration of MENA markets with international markets is insignifi8cant.

- Matthias Busse, Carsten Hefeker, "Political risk, institutions and foreign direct investment, European Journal of Political Economy, 23, 2007.

The study found the following main results:

- Government stability, religious tensions, and democratic accountability are highly significant determinants of foreign investment inflows.
- Countries with higher political risk attract less foreign direct investment.
- Political risk and institutional indicators come first when multinational corporations confront decisions about where to invest.

- Olga Kuzmina, Natalya Volchkova and Tatiana Zueva, "Foreign direct investment and governance quality in Russia", Journal of Comparative Economics, 42, 2014.

The study found the following main results:

- The quality of governance, illustrated by illegal payments, criminal rates, enforcement authorities and corruption, has a considerable effect on the level of investment, in general, and foreign direct investment, in particular.
- Poor quality of governance decrease the ability of countries to attract foreign direct investment, as this decreases the reward to investment.

- Tomasz P. Wisniewski and Saima K. Pathan, "Political environment and foreign direct investment: Evidence from OECD countries", European Journal of Political Economy, 36, 2014.

The study found the following main results:

- Inflation of government spending, especially for military purposes, impedes foreign direct investment inflows.
- Duration of stay in power and totalitarian are negatively related to foreign direct investment inflows.
- Democracy is positively related to foreign direct investment inflows.
- Removing political uncertainty is an essential ingredient in fostering an investment-friendly climate.

- Sandra Aguiar, Luis Aguiar-Conraria, Mohamed Azzim Gulamhussen, Pedro C. Magalhäe, "Foreign Direct Investment and Home-Country Political Risk: The Case of Brazil", Latin American Research Review, Vol. 47, No. 2, 2012.

The study found the following main result:

- The negative relationship between risk and FDI is related to the quality of policy formulation and implementation.

- Enrico C. Perotti and Pieter van Oijen, "Privatization, political risk and stock market development in emerging economies", Journal of International Money and Finance, 20, (2001).

The study found the following main results:

- Privatization has the power to decrease the tension related to political risk, as privatization strengthens the institutional framework of the country and increase investors' confidence.
- Decreasing the level of political risk is a main source for growth of emerging stock markets.

▪ Yue-cheong Chan and K.C. John Wei, "Political risk and stock price volatility: The case of Hong Kong", Pacific-Basin Finance Journal, 4, (1996).

- Political news strongly affects stock market volatility.
- Favourable political news positively affects stocks' returns for GARCH-M index and vice versa.
- Political shocks just affect volatility but not the returns of Red-Chip index which makes Red-Chip index a safe haven from political shocks for investors on the Hong Kong economy.

▪ Eugene. F. Fama and Kenneth R. French, "Business Conditions and Expected Returns on Stocks and Bonds", Journal of Financial Economics, 25, North-Holland, 1989.

The study found the following main result:

- Expected returns on long term securities (common stocks and long-term bonds) have a term or maturity premium that has a clear business-cycle pattern, as these returns tend to increase while moving to trough and to decrease while moving to the peak.

The previous literatures mainly concentrate on economic effects of political risks on stock markets, foreign investments and government securities. The following points are the main conclusion that may serve this research

- The level of political risk has negative effects on stock markets returns and volatilities; and that movements of international capital flows may aggravate the impact of this negative effect.
- Effects of political changes and changes in the level of political risk on stock market are heterogeneous, as they vary across different countries and regions.
- Returns on government securities are positively related to the level of political risk in the country.
- Political risk premium has to be considered while preparing discount factor for investment cash flows.
- Political risk is a significant determinant of foreign investment inflows and the relationship is negative.

2.2 Studies Related to Economic variables Considered by the Study

▪ Adrian Fernandez-Perez, Fernando Fernández-Rodríguez, and Simón Sosvilla-Rivero, "The term structure of interest rates as predictor of stock returns: Evidence for the IBEX 35 during a bear market", International Review of Economics and Finance, 31, 2014.

The study found the following main results:

- There is an increasing role of the yield curve as an indicator of the state of the economy.
- Yield curves have some information content that helps to better forecast the probability of bear markets.

▪ Andrea Buraschi and Alexei Jiltsov, "Inflation Risk Premium and the expectations hypothesis", Journal of Financial Economics, 75, 2005.

The study found the following main results:

- Inflation risk premium explains 23% of the time variation in the five-year forward risk premium, and 42% of the time variation in the ten-year forward risk premium
- Inflation risk premium plays an important role in explaining deviations from the expectations hypothesis of interest rates.
- Risk premium varies with inflation rate volatility.
- Monetary shocks are responsible for 43% of the volatility of the forward risk premium.
- Inflation risk premium is time varying, as short-term interest rate contains a small inflation risk premium and longer-term interest rate contains a relatively large inflation risk premium.

▪ Andrew Ang and Monika Piazzesi, "A no-arbitrage vector auto-regression of term structure dynamics with macroeconomic and latent variables", Journal of Monetary Economics, 50, 2003.

- Inflation rates are highly correlated with yields; however, this correlation is high for short-term yields and small for long-term yields.

- Real activity is weakly correlated with financial assets yields for any maturity.

From the previous studies we can conclude that:

- Domestic interest rate may work as an indicator to the level of risk.
- Inflation rate represents a risk premium to be covered by interest rate.
- Political changes are able to explain fluctuations in domestic interest rates which make domestic interest rate an indicator to country status.

In the light of previous literatures, this research will try to analyze political risk index of Egypt and its sub-indicators in order to study:

- The effect of political risk on number of economic variables that are related to financial and real investment.
- The effect of political risk on the economy as a whole and the process of economic development.

3. Political Changes and Indicators of Political Risk in Egypt

As mentioned before, components of political risk index are divided into six sub-indicators. This section examines changes in political risks' sub-indicators as a response to political changes and the mutual relationship between the six sub-indicators that form political risk index in Egypt.

3.1 Behavior of and Changes in Political Risks' Sub-Indicators

Figure (1) shows that indicators of political risk have had noticeable changes especially after 25th of January revolution except for *government effectiveness* and *control of corruption* indicators which stayed at levels 0.5 and 0.33 respectively during the considered period. The following points summarize the performance of political risks' sub-indicators as a response to political changes in Egypt. An indicator with points near to 1 indicates a relatively very low risk indicator, while an indicator with points near to 0 indicates a relatively very high risk indicator.

- The most vulnerable and risky indicator of political risks' sub-indicators is voice and accountability indicator, as points awarded to this indicator were always below 0.5 and hence it is always located in very high risk zone. Prior to 25th of January (from 2006 to 2010), the indicator recorded 0.4 average points and during revolutions period this average points has been dropped to 0.24. Voice and accountability indicator recorded average points 0.33 during the whole considered period (2006-2014) with standard deviation 0.09 points.

- In spite that political stability and absence of violence indicator is the less risky indicator of all political risks' sub-indicators before January revolution, as it was located in the range of low risk zone (0.7-0.79) with average points 0.77 prior to 25th of January revolution; however, it suffered a severe decline just after announcing the results of parliamentary elections in 2010, and this downward sloping trend holds during revolution periods (2011-2013), and the indicator moved to moderate risk zone (0.6-0.69) with average points 0.63 and comes in the second place with respect to vulnerability with standard deviation 0.08 points.

- Rule of law indicator occupies the third place with respect to vulnerability with standard deviation 0.06 points, where it moved from moderate risk zone (0.6-0.69) with average points 0.60 prior to January revolution to high risk zone (0.5-0.59) with average points 0.5 during revolution periods.

- Finally, regulatory quality indicator has had a slight drop during revolutions period (2011-2013), but once revolutions period has ended it returned back to its first position. This indicator recorded 0.47 points, in average, during revaluations period and returned back to 0.5 points just after June revolution.

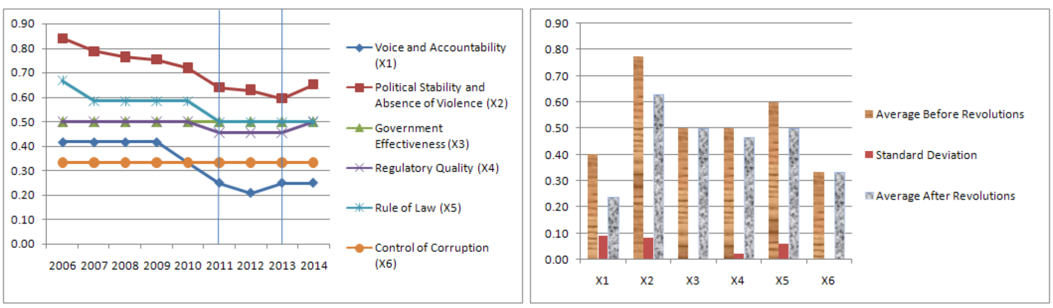


Figure 1. Performance of political risks sub-indicators

Source: Authors calculations based on data extracted from International Country Risk Guide (ICRG) and Indicators.

It should be noted that 25th of January and 30th of June revolutions did not lead to any improvement to indicators of political risk nor to effective and accountable governance; on contrary, they contributed to deterioration of some of political risks' sub-indicators. Best proof of that is the deterioration of political risk index after the two revaluations, where political risk index recorded 0.44 points, in average, after revolutions period compared to 0.52 points prior to revolutions. Retreating of political risk index by 0.08 points has led to movement of political risk index from high risk zone (0.5-0.59) to very high risk zone (below 0.5). Voice and accountability and control of corruption are the most two risky indicators of political risk index followed by regulatory quality, government effectiveness, rule of law and finally political stability and absence of violence.

Friedman test (non-parametric statistical test) has been used to verify the extent of change in political risk index before, during and after period of revolutions. The test revealed that changes in political risk index are statistically significant at degree of freedom 2 and level of significance 5%. See Table 1.

Table 1. Friedman test of political risk index

N	6
Chi-Square	7.000
df	2
Asymp. Sig.	0.030

Source: Outputs of Statistical Package for the Social Sciences (SPSS).

Accordingly, political changes that started on 25th of January 2011 have resulted in significant change in the level of political risk of Egypt. In other word, political changes have increased the level of political and country risk.

3.2 Correlation of Political Risks' Sub-Indicators

While sub-indicators of political risk will be used as explanatory variables on more than one occasion in this study; then it is useful to determine the mutual relationship between these explanatory indicators.

Pearson correlation test is used to examine the mutual relationship between sub-indicators of political risk index. The test revealed the following findings (see Table 2).

- Voice and accountability indicator (X_1) is highly and positively correlated with political stability and absence of violence indicator (X_2) (Pearson correlation is 0.911, with p-value 0.000); regulatory quality indicator (X_4) (Pearson correlation is 0.799, with p-value 0.001); and rule of law indicator (X_5) (Pearson correlation is 0.891, with p-value 0.000).
- Political stability and absence of violence indicator (X_2) is highly and positively correlated with regulatory quality indicator (X_4) (Pearson correlation is 0.761, with p-value 0.003); and rule of law indicator (X_5). (Pearson correlation is 0.975, with p-value 0.000); while it is negatively correlated with control of corruption indicator (X_6) (Pearson correlation is -0.731, with p-value 0.005).
- Regulatory quality indicator (X_4) is highly and positively correlated with rule of law indicator (X_5) (Pearson correlation is 0.712, with p-value 0.006).
- Rule of law indicator (X_5) is highly and negatively correlated with control of corruption indicator (X_6) (Pearson correlation is -0.743, with p-value 0.004).

Table 2. Pearson correlation test of political risks' sub-indicators

Risk Indicators	X1	X2	X3	X4	X5
X2	0.911				
P-Value	0.000				
X3	*				
P-Value	*				
X4	0.799	0.761	*		
P-Value	0.001	0.003	*		
X5	0.891	0.975	*	0.712	
P-Value	0.000	0.000	*	0.006	
X6	-0.539	-0.731	*	-0.365	-0.743
P-Value	0.057	0.005	*	0.220	0.004

Source: Minitab, outcomes of Correlation Test.

The previous statistical analysis shows that indicators of political risk are highly correlated, which distorts the *t* test of indicators' coefficients and makes it difficult to determine whether any of political risks' sub-indicators are linearly related to dependent variables, a problem known as *multicollinearity* in regression analysis. Accordingly, using *stepwise* method in analyzing the effect of political risks' sub-indicators on different variables will be must.

The high correlation between political risks' sub-indicators increases the responsiveness of political risk index to changes in its sub-indicators. On other word, the mutual relationship between political risks' sub-indicators makes political risk index more vulnerable to any changes in one of its sub-indicators; then, any deterioration in one of political risks' sub-indicators may lead to a severe deterioration in the whole political risk index. On the bright side, any improvement in one of political risks' sub-indicators may lead to further improvement in political risk index.

4. Political Risk and Egyptian Exchange

4.1 Historical Overview of the Performance of Main index of Egyptian Exchange (EGX30)

It becomes known that high level of political risk has a considerable negative effect on stock markets whether they are emerging or developed markets (Dimic et al., 2015), which holds true for the case of Egyptian Exchange. Political changes that started on 25th of January 2011 have had their effects on the Egyptian Exchange, in general, and its main index EGX30, in particular. Figure 2 illustrates historical overview of the performance of EGX30 index since its birth in 1998 until year 2015. The index reached its peak in 22/4/2008 with a record of 12039 points, after that and as a response to changes in tax policies, rumors regarding tax accounting for transactions in securities and global financial crisis 2008, the performance of EGX30 index started to deteriorate severely. In 2009, Egyptian Exchange started to recover and EGX30 index reached another peak in 2010 with a record of 7693.38 points. In early 2011, the index started to take a downward sloping trend again this time the reason was the outbreak of the Arab spring, in general, and the 25th of January revolution, in particular. In this regard, trading transactions in Egyptian stock market have been suspended from the 27th of January 2011 till 23rd of March 2011, which was as a warning of the departure of Egyptian Exchange main index (EGX30) of emerging markets index.

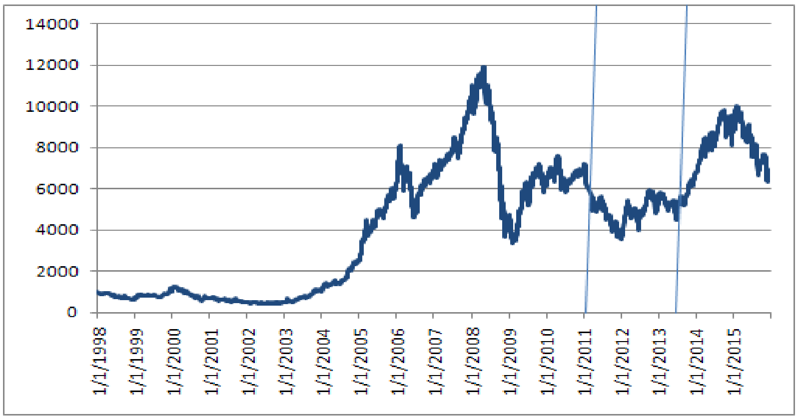


Figure 2. The performance of main index of Egyptian Exchange (EGX30)

Source: Authors calculations based on data extracted from Egyptian Exchange.

Figure 3 illustrates a detailed analysis of EGX30 daily returns during the considered time period (2006-2015). The analysis revealed that political changes and the accompanying rise in the level of political risk have had the greatest negative impact on EGX30 daily returns, as the worst average daily rate of return on EGX30 index was -0.308% in 2011, followed by the one resulted from the impact of global financial crisis in 2008, where the average daily rate of return on EGX30 was -0.306%.

On the other side, average daily rate of return on EGX30 achieved positive rates in 2009 and 2010 (0.143% and 0.065% respectively), which could be attributed to the ability of the Egyptian economy, in general, and the banking system, in particular, to absorb the negative effects of the global financial crisis and to solidify against global crisis 2008, as a result of reform policy of Egyptian banking system in 2003.

After the election of a new president in 2012, average daily rate of return on EGX30 started to increase and reached 0.184%; however, it declined again in 2013 in the wake of 30[th] of June revolution to 0.097%. In light of relative political stability achieved after June revolution, average daily rate of return on EGX30 increased to 0.121% in 2014 and reached a peak record of 9811.4 points in 10/1/2014.

In 2015, a global financial crisis emerged again as a result of Chinese stock bubble, currencies war, and the collapse of oil prices, and again average daily rate of return on EGX30 decreased by 22% and turn to be negative at -0.088%.

As for EGX30 risk, it can be analyzed based on number of indicators such as standard deviation, skewness and kurtosis. The coefficient of kurtosis reached 5.3 in 2011 indicating an increase in the level of risk, which may be attributed to changes in political status. From Figures 2 and 3, it can be said that kurtosis coefficient reflects the performance of average daily return on EGX30, as it recorded another high number 6.8 in year 2008 when average daily return on EGX30 was negative due to negative impacts of the global financial crisis on Egyptian Exchange. After June revolution, the coefficient of kurtosis decreased which indicates that the negative impact of political changes on Egyptian Exchange has been retreated.

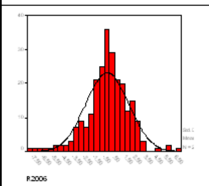
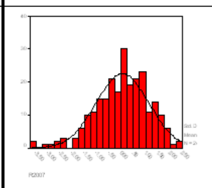
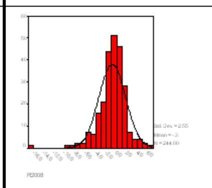
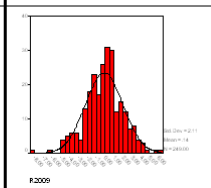
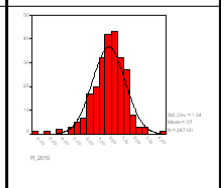
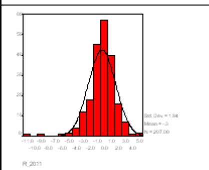
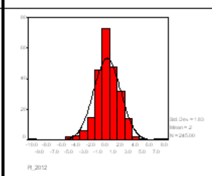
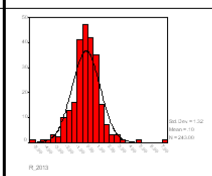
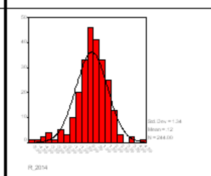
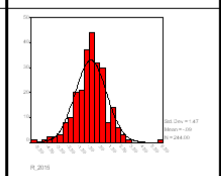
Year	2006	2007	2008	2009	2010
chart					
Mean	0.050544	0.175615	-0.30661	0.143088	0.065726
Std. Deviation	2.084482	1.077969	2.550325	2.112103	1.340765
Skewness	-0.43236	-0.55513	-1.28703	-0.20701	-0.74587
Kurtosis	1.76518	0.516958	6.849536	0.804289	2.541995
Year	2011	2012	2013	2014	2015
chart					
Mean	-0.30842	0.184442	0.097831	0.121642	-0.08839
Std. Deviation	1.936094	1.825717	1.323727	1.341939	1.474815
Skewness	-1.14122	-0.26587	0.3547	-0.78859	-0.07465
Kurtosis	5.309711	4.585201	4.764358	2.391742	2.033217

Figure 3. Histogragms of average daily returns on EGX30

Source: Authors calculations based on data extracted from Egyptian Exchange.

4.2 Political Changes and Returns on EGX30

A regression analysis has been developed to verify the effect of political changes on EGX30 daily and annual returns. Political risks' sub-indicators will act as independent variables, while returns on EGX30 act as the dependent variable. The statistical analysis revealed that the relationship between daily returns on EGX30 and political risks' sub-indicators is statistically insignificant; and that of the six sub-indicators of political risk index there is only one that is statistically significant with annual return on EGX30. Control of corruption (X_6) has a negative relationship (coefficient -1060) with annual returns on EGX30 [R-Sq = 45.2% R-Sq(adj) = 40.3%, F statistic is 9.08 with p-value 0.012]. See Appendix 1.

In spite that this finding is a confusion one; however, it is comparable with the finding of Egger and Winner (2005), as they found a positive relationship between the level of corruption and foreign direct investment and they suggest that corruption may act as a helping hand to encourage foreign direct investment inflows.

4.3 Examine the Variation and Homogeneity of Average Daily Returns on EGX30

Onaway ANOVA test has been used to examine the significant of variations of Egyptian Exchange returns as a response to changes in the level of political risk. See Table 3.

Table 3. ANOVA test statistics of EGX30 daily returns

EGX30-Returns	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.026	2	2.513	0.806	0.447
Within Groups	7505.843	2407	3.118		
Total	7510.869	2409			

Source: Outputs of Statistical Package for the Social Sciences (SPSS).

F test, at a degree of freedom 2 and level of significance 0.05, revealed that average daily return on EGX30 did not respond to changes in the level of political risk, which goes in line with the finding of Lehkonen and Heimonen (2015), as their study indicated that the effect of political risk on stock returns fades gradually.

Test of Homogeneity of Variances has been used to examine the significant of homogeneity of average daily return on EGX30 as a response to changes in the level of political risk. See Table 4.

Table 4. Homogeneity test statistics of EGX30 daily returns

	Levene Statistic	df1	df2	Sig.
EGX30-Returns	15.761	2	2407	0.000

Source: Outputs of Statistical Package for the Social Sciences (SPSS).

Levene statistic is significant, at level of significance 0.05, which indicates that stocks returns as a response to changes in the level of political risk are heterogeneous. What is worth mentioning that this finding is consistent, to a large extent, with the finding of (Voth, 2002), (Apergis, 2015) and (Vortelinos & Saha, 2016), as their studies indicated that the effect of political risk on stocks is volatile and intermittent.

4.4 Examine the Variation and Homogeneity of Traded Stocks Value

Again, Onaway ANOVA test has been used to examine the significant of variations of traded stocks value as a response to changes in the level of political risk. See Table 5.

Table 5. ANOVA test statistics of EGX30 traded value

EGX30-Traded Value	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.8E+20	2	9.1E+19	588.336	0.000
Within Groups	3.7E+20	2407	1.5E+17		
Total	5.6E+20	2409			

Source: Outputs of Statistical Package for the Social Sciences (SPSS).

F test, at a degree of freedom 2 and level of significance 0.05, revealed that value of traded stocks did respond to changes in the level of political risk.

Test of Homogeneity of Variances has been used to examine the significant of homogeneity of stocks traded value as a response to changes in the level of political risk. See Table 6.

Table 6. Homogeneity test statistics of EGX30 traded value

	Levene Statistic	df1	df2	Sig.
EGX30-Traded Value	162.483	2	2407	0.**000**

Source: Outputs of Statistical Package for the Social Sciences (SPSS).

Levene statistic value is significant, at level of significance 0.05, which indicates that stocks traded value as a response to changes in the level of political risk are heterogeneous. This illustrates that value of traded stocks responds to the status of the economy, in general, and financial market status, in particular.

A regression analysis has been developed to verify the effect of political changes on the value of traded stocks. This time, political risks' sub-indicators will act as independent variables, while values of traded stocks act as the dependent variable. The statistical analysis has ascertained that values of traded stocks respond to the level of political risk and that voice and accountability (X_1) and control of corruption (X_6) sub-indicators are statistically significant and positively related to values of traded stocks [R-Sq = 86.4% R-Sq(adj) =83.6%, F statistic is 36.66 with p-value 0.000]. See Appendix 2.

Foreign traders (Arabs and non-Arabs) respond to the same two political risks' sub-indicators, as there is a significant statistical and positive relationship between value of traded stocks by foreigners and both voice and accountability (X_1) and control of corruption (X_6) sub-indicators. See Appendix 3 and 4.

Egyptian traders also respond to changes in the level of political risk; however, they concern with regulatory quality and the level of corruption, as changes in values of traded stocks by Egyptians are positively related to regulatory quality (X_4) and the control of corruption (X_6) sub-indicators. See Appendix 5.

5. Political Risk and Foreign Investment Flows

5.1 Behavior of Foreign Investment Flows

Figure 4 shows that both net flows of foreign direct and indirect (portfolio) investment have been retreated with the outbreak of January revolution; however, the decline in net flows of portfolio investment was harsher relative to the decline in net flows of foreign direct investment, as net flows of portfolio investment decreased by 132.4% and moved to the negative zone at -2551 million US dollars in 2011 compared to a decrease by 67.6% in foreign direct investment net flows.

After January revolution, net flows of portfolio investment continued to decline and reached -5025 million US dollars in 2012, with a decline of 97%, while foreign direct investment net flows increased by 82% in the same year (from 2188 in 2011 to 3982 million US dollars in 2012).

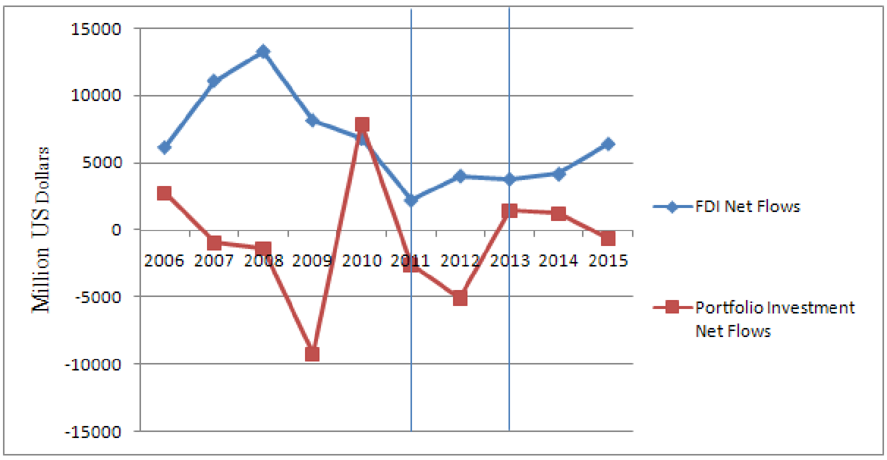


Figure 4. Foreign investment net flows

Source: Ministry of Finance, Monthly Financial Report, different editions.

The previous characteristics of both foreign direct and portfolio investment make foreign direct investment more desirable over portfolio investment especially for implementation of development plans in developing countries. Changes in both types of foreign investment net flows illustrate that portfolio investment is relatively more vulnerable, as standard deviation of changes in portfolio investment net flows during the considered period was 7686 million US dollars compared to 3178 million US dollars for foreign direct investment. Accordingly, Matthias Busse and Carsten Hefeker (2007) call for not to rely on portfolio investment for financing development plans, as this may lead to financial and economic crises, and they advise countries to do their best to attract foreign direct investment. Figure 5 illustrates changes in net flows of foreign direct and portfolio investment.

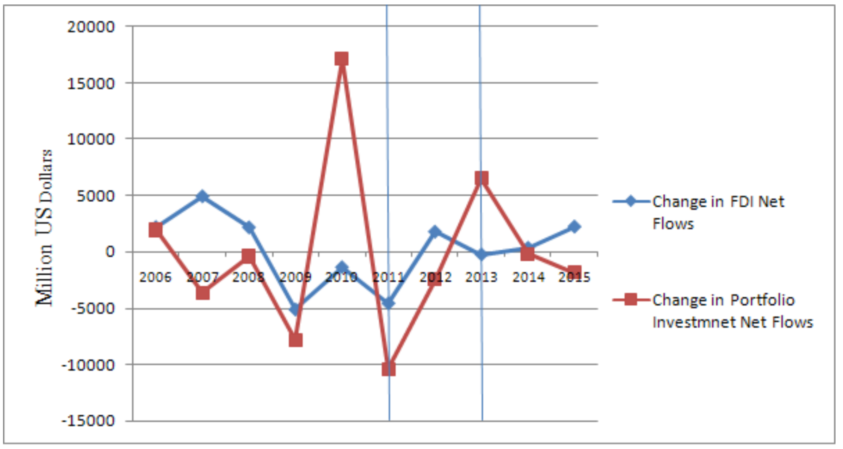


Figure 5. Changes in foreign investment net flows

Source: Ministry of Finance, Monthly Financial Report, different editions.

5.2 Political Risk Index and Foreign Investment Flows

The effect of changes in political risk index on foreign investment flows will be examined by using regression analysis in which sub-indicators of political risk index act as independent variables or explanatory variables and foreign direct and portfolio investment net flows and their changes act as dependent variables.

The statistical analysis revealed the followings:

- There is a statistical significant positive relationship between foreign direct investment net flows and both voice and accountability indicator (X_1) and control of corruption indicator (X_6) [R-Sq = 80.2% R-Sq(adj) = 76.2%, F statistic is 20.24 with p-value 0.000]. See Appendix 6.
- The statistical relationship between changes in foreign direct investment net flows and political risks' sub-indicators is insignificant [R-Sq = 10% R-Sq(adj) = 0%, F statistic is 0.16 with p-value 0.971]. See Appendix 7.
- The relationship between portfolio investment net flows and political risks' sub-indicators is statistically insignificant [R-Sq = 47.3% R-Sq(adj) = 9.7%, F statistic is 1.26 with p-value 0.377]. See Appendix 8.
- The regression analysis of changes in portfolio investment net flows and political risks' sub-indicators confirms the previous statistical finding, as the relationship between changes in portfolio investment net flows and political risks' sub-indicators is statistically insignificant [R-Sq = 64.0% R-Sq(adj) = 38.3%, F statistic is 2.49 with p-value 0.133]. See Appendix 9.

According to the previous statistical findings it can be said that:

- Decreasing the extent of military intervention in politics, prevailing of democracy, and controlling corruption are all attractive elements for foreign direct investment in Egypt; however, controlling corruption has a greater impact on attracting foreign direct investment, as coefficient of controlling corruption consists of 6 digits (103489), while coefficient of voice and accountability consists of 5 digits (34492).
- In spite that net flows of foreign direct investment respond to changes in political risks' sub-indicators; however, changes in net flows of foreign direct investment do not. In other word, it can be said that changes in foreign direct investment is relatively inelastic to changes in political risks' sub-indicators. This is due to the difficulty of withdrawal of foreign direct investment from the economy.
- The nature and characteristics of portfolio investment make net flows of portfolio investment and their changes irrelevant to changes in political risks' sub-indicators, as this type of capital flows is highly vulnerable, pursuits just high and quickly profit, and based mainly on the perception of investors rather than changes in political status and level of political risk.

6. Political Risk, Domestic Interest Rates, and Public Debt

6.1 Attitude of Domestic Interest Rates as a Response to Political Changes

Interest rates are usually related to the level of risk, according to this fact trying to figure out a relationship between domestic interest rates and risks resulting from political changes in Egypt will be useful not just to understand the direct effect of political changes on domestic interest rates, but also to understand the indirect effect of political changes on other variables that are related to domestic interest rates such as consumption, saving, investment, and public debt.

Domestic interest rates will be represented in this section by six interest rates on different financial instruments, for different maturities and from different sources: Central Bank of Egypt discount rate, interest rate on short-term loans, interest rate on short-term deposits, interest rate on 3 months treasury bills, interest rate on investment certificates (long-term deposits), and interest rate on deposits at post-office (small savers short-term deposits).

Table 7 and Figure 6 show that the trend of maximum, minimum and average domestic interest rates is negative (downward sloping) just before 25th of January 2011 revolution and then it turns to be positive (upward sloping) just after January revolution. The upward tendency of domestic interest rates holds until the 30th of June 2013 revolution; and then, it turns to decline again and follows a downward sloping trend just after June revolution. What is worth mentioning that domestic interest rates in Egypt responded to global financial crisis 2007 as well, as it declined during years 2007 and 2008 as a response to effects of global financial crisis on the Egyptian economy. Global financial crisis 2007 negatively affected stocks prices and positively affected the public budget deficit as a result of the decrease in government expenditures on subsidized imported goods (Sultan Abou Ali, 2008). However, responsiveness of domestic interest rates to political changes is relatively stronger than its responsiveness to financial crises, where the slope of average domestic interest rate line is much steeper during periods of revolutions (1.19) and political stability (-1.11) relative to the period of financial crisis (-0.17).

Table 7. Behavior of domestic interest rates

	Before Revolutions (%)				
	2006	2007	2008	2009	2010
Max Interest	12.71	12.64	12.22	12.39	11.35
Min Interest	6.53	6.01	6.09	7.03	5.97
Range	6.18	6.63	6.13	5.36	5.38
Average	9.34	9.3	9.13	9.84	9.04
Standard Deviation	1.98	2.15	2.24	1.79	1.79
	After Revolutions (%)				
	2011	2012	2013	2014	2015
Max Interest	10.84	13.38	13.35	11.92	11.71
Min Interest	6.52	7.26	7.77	7.19	6.99
Range	4.32	6.12	5.58	4.73	4.72
Average	9.09	10.28	10.75	9.64	9.62
Standard Deviation	1.51	2.15	2.12	1.75	1.79

Source: Authors calculations based on data extracted from Ministry of Finance, The Financial Monthly Report, different editions.

Standard deviation of average domestic interest rates could be a good indicator of volatility of domestic interest rates. Figure 6 shows that standard deviation of domestic interest rates recorded relatively high rates during periods of internal and external shocks. For instance, during period of global financial crisis (an external shock) 2007and 2008 standard deviation of domestic interest rates recorded 2.15% and 2.24% respectively and then decreased to 1.79% in 2009 and 2010. On another occasion, standard deviation of domestic interest rates increased again to 2.15% and 2.12% in 2012 and 2013, the increase in standard deviation this time is attributed to status of political instability in Egypt. Thus, behavior of standard deviation of average domestic interest rates indicates that interest rates are vulnerable (elastic) to internal and external shocks.

The attitude of average domestic interest rates and its standard deviation in Egypt is consistent with the finding of Andrea and Alexei, as they assert that the price of risk is state-dependent and can explain the conditional volatility of interest rates (Andrea Buraschi & Alexei Jiltsov, 2005).

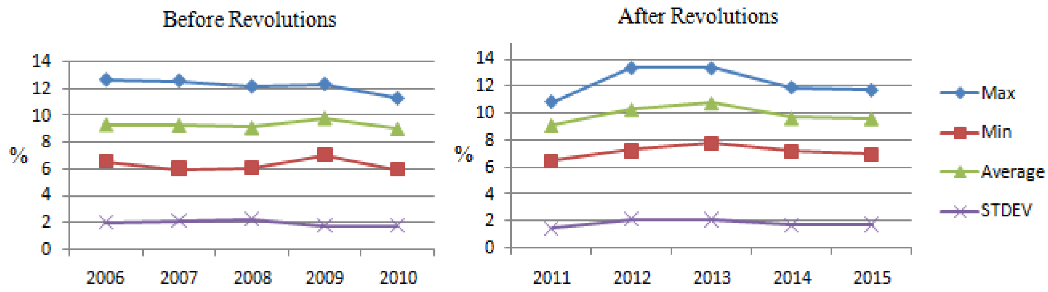


Figure 6. Attitude of domestic interest rates before and after revolutions

Source: Table 1.

6.2 Political Changes and Components of Domestic Interest Rates Structure

The behavior of domestic interest rates can be explained more precisely by analyzing the performance of their main components during periods of noticed political changes. Figure 7 shows the development of six interest rates with different maturities and types that form domestic interest rates structure in Egypt. Number of points can be excluded from this figure:

- The most volatile interest rate is interest rate on investment certificates (relatively long-term deposits), as standard deviation of average interest rate on investment certificates increased by 0.7 after 25th of January revolution (1%-0.3%). This may be attributed to the contractionary monetary policy adopted by Central Bank of Egypt to contain high inflation rates and reduce speculation operations on US dollar, with expectations of sustained high prices in the future and continuous devaluation of the Egyptian pound.
- The most responsive interest rate to political changes is the one on treasury bills (short-term government bonds), as average interest rate on 91 days treasury bills increased by 2.73% after 25th of January revolution (11.9%-9.1%). This may be attributed to the increase in the level of political risk as a result of political changes and the consequent increase in lending risk.
- Average interest rate on short-term deposits at post-office decreased by -0.53% after 25th of January revolution (8.83%-9.5%). This tendency of short-term interest rate is consistent with Taylor rule, which implies that short-term interest rate carries low inflation risk premium (Taylor, 1993).
- In spite that average interest rate on short-term deposits (3 months deposits) increased after 25th of January revolution; however, it still lower than average interest rate on deposits at post-office.
- Average interest rate on short-term loans decreased after 25th of January revolution, this may be attributed to the severe recession period that the Egyptian economy has witnessed just after the revolution and the consequent decrease in the level of investments. In other ward, short-term interest rate on loans is designed to correct aggregate output deviations, which is also consistent with Taylor rule.

Regression analysis of components of domestic interest rates (as dependent variables) and political risk index components or indicators (as independent variables) may accurately explain responsiveness of domestic interest rates to political changes. Of the six types of interest rates that form domestic interest rate structure and the six sub-indicators of political risk index there are only three interest rates (interest rate on short-term loans, interest rate on deposits at post office, and interest rate on treasury bills) of a significant statistical relationship with only two sub-indicators of political risk index (political stability and absence of violence; and control of corruption).

- There is a direct relationship between interest rate on short-term loans and political stability and absence of violence [R-Sq = 71% R-Sq(adj) = 68%, F statistic is 26.95 with p-value 0.000]. This can be explained as during periods of political stability demand for investment increases and generates upward pressures on loans' interest rates. See Appendix 10.
- There is an inverse strong relationship between interest rate on deposits at post office (short-term deposits) and the ability to control corruption [R-Sq = 82.5% R-Sq(adj) = 80.9%, F statistic is 51.9 with p-value 0.000]. This might be related to the positive effect of containing corruption on small savers' incomes and public budget deficit. See Appendix 11.
- There is an inverse relationship between interest rate on treasury bills and political stability and absence of

violence [R-Sq = 59.6% R-Sq(adj) = 55.91%, F statistic is 16.2 with p-value 0.002]. This is a logical finding as with high degree of political instability and violence the risk of lending to country increases and interest rates on government securities increase as well. In other word, interest rates on government securities are function of risk premiums that mainly result from political instability. See Appendix 12.

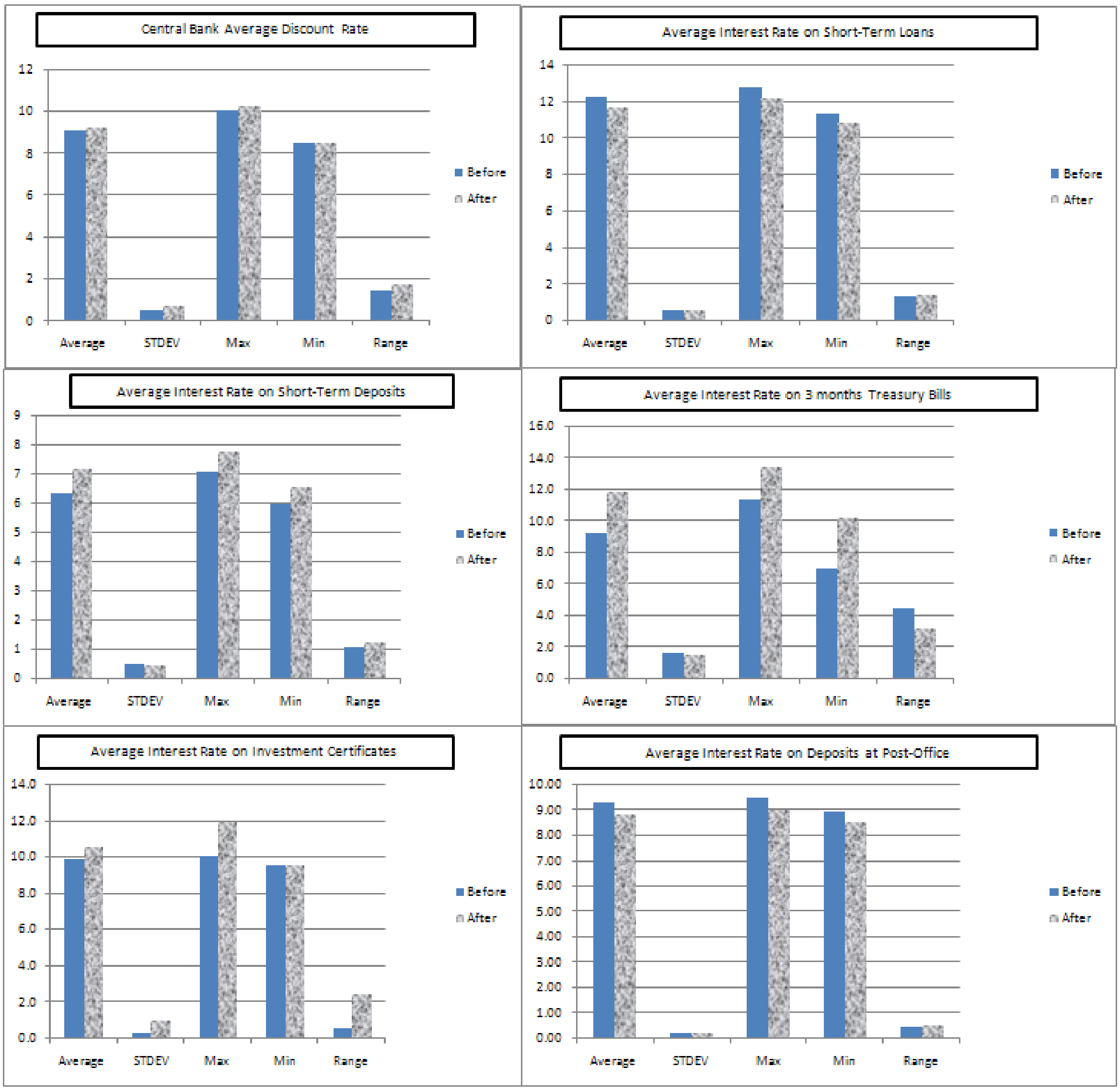


Figure 7. Development of interest rates that form domestic interest rate structure

Source: Authors calculations based on data extracted from Ministry of Finance, The Financial Monthly Report, different editions.

6.3 Domestic Public Debt and Political Changes

Figure 8 shows that domestic public debt has been aggravated since January revolution, as domestic public debt was 755.3 billion Egyptian pounds in 2010; and then increased to 2116.3 billion Egyptian pounds in 2015. This means that domestic public debt has increased by 180% during period of revolutions. In spite the trend of domestic public debt before revolutions was positive; however, the change in domestic public debt was in average 77.2 billion Egyptian pounds during the time period (2006-2010); and then increased to 245.5 billion Egyptian pounds during the time period (2011-2015), with an increase of 218%. The only logical explanation for this significant inflation in domestic public debt is the occurrence of two successive revolutions in a short time period and their negative consequences on the political status in Egypt.

A regression analysis between domestic public debt (as a dependent variable) and political risk sub-indicators (as explanatory variables) confirmed the validity of this suggested explanation. The analysis found a statistically significant negative relationship between domestic public debt and political stability and absence of violence ((R-Sq = 82.1% R-Sq(adj) = 80.5%, F statistic is 50.61 with p-value 0.000). See Appendix 13.

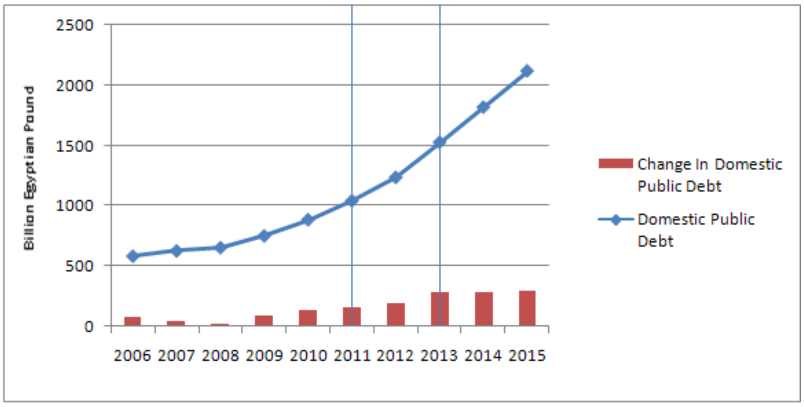


Figure 8. Development of domestic public debt in Egypt

Source: The Egyptian Cabinet, Information and Decision Support Center.

Unfortunately, the problem of aggravation of domestic public debt does not come alone, as it always associated with another problem which is aggravation of debt service payments (interest on debt).

Figure 9 shows that interest payments on domestic public debt was 69.5 billion Egyptian pounds in 2010; and then this number increased by 171% and climbed to 188.3 billion Egyptian pounds in 2015. The change in interest payments on domestic debt recorded in average 8 billion Egyptian pounds per year during the time period that preceded January revolution (2006-2010); then this figure has tripled during the period of revolutions and recorded in average 23.8 billion Egyptian pounds per year during the time period (2011-2015).

Actually, the massive increase in interest payments on domestic public debt is attributed to two factors; the increase in the level of domestic public debt and the increase in interest rate on government securities. While domestic public debt and interest rate on government securities are both linked to political changes and the level of political risk, as confirmed earlier, then finding a relationship between interest payments on domestic debt and political changes will be a logical one. This has been proven statistically, as there is a statistically significant negative relationship between interest payments on domestic public debt and political stability and absence of violence [R-Sq = 77.8% R-Sq(adj) = 75.7%, F statistic is 38.48 with p-value 0.000]. See Appendix 14.

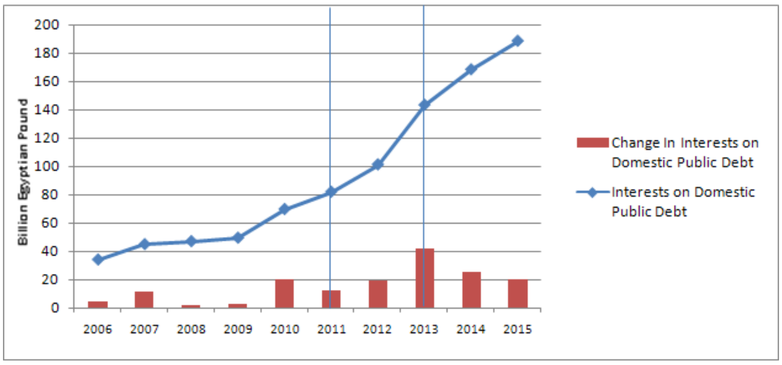


Figure 9. Development of interest on domestic public debt in Egypt

Source: The Egyptian Cabinet, Information and Decision Support Center.

7. Political Changes and Macroeconomic Goals

Figure 10 shows that, the sharp decline in the rate of economic growth occurred in 2011, the most reasonable explanation for that is the occurrence of 25th of January revolution. This low rate of economic growth continues during period of political instability below its potential growth rate, and it began to improve only after the 30th of June revolution and the partial regaining of political stability after presidential election in 2014.

With economic growth rates that are below their potential rates it was natural for the unemployment rate to increase. In spite the improvement in economic growth rate did not manage to change the upward trend of unemployment rate; however, the slope of this trend became more falter after this improvement (the slope of unemployment curve was 3 in 2011, 0.7 in 2012, 0.5 in 2013, 0 in 2014 and 0.3 in 2015).

Responsiveness of inflation rate to changes in political status in Egypt was not clear, as fluctuations of inflation rates are not related and can't be explained by changes in political status.

In contrast, it is clear that changes in exchange rates are due to political changes, as exchange rates were relatively stable tell 2010 and then the upward trend of exchange rates starts just after 25th of January revolution. This upward sloping trend continues even after presidential election in 2014, where the so-called Arab Spring has destroyed the sources of foreign currencies for most Arab countries. For Egypt, political instability has destroyed one important source of foreign exchange which is tourism. Tourism returns, before periods of revolutions (2006-2010), represented in average 24.5% of total exports; and after revolutions (2011-2014) this number decreased to 18%, where number of tourists (arrivals) decreased in average by 14% from year 2011 to 2014 (World Bank, World Development Indicators). In addition, the returns of tourism sector decreased by 28.3% in average after year 2010, as tourism returns recorded 1024.7 million US dollars in average during the time period (2006-2010) and this number decreased to 734.5 million US dollars in average during the time period (2011-2014) (The Egyptian Cabinet, Information and Decision Support Center).

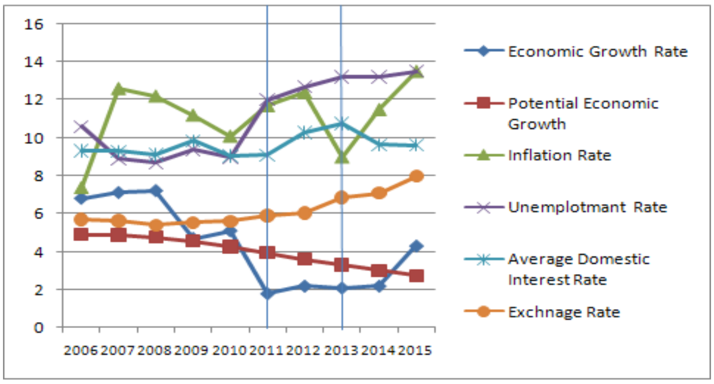


Figure 10. Attitude of macroeconomic variables

Source: Authors calculations based on data extracted from Ministry of Finance, The Financial Monthly Report, different editions and World Bank statistics on the internet.

Regression analysis of economic growth rate, inflation rate, unemployment rate and exchange rate (as dependent variables) and political risk components (as independent or explanatory variables) may accurately explain effects of political changes on these macroeconomic variables. The outcomes of the regression analysis were as follows. See Appendix 15, 16, 17 and 18.

- Economic growth rate is positively related to voice and accountability and control of corruption sub-indicators [R-Sq = 84.8% R-Sq(adj) = 81.7%, F statistic is 27.83 with p-value 0.000].
- Unemployment rate is negatively related to voice and accountability and control of corruption indicators [R-Sq = 70.1% R-Sq(adj) = 64.1%, F statistic is 11.7 with p-value 0.002].
- Political risks' sub-indicators are statistically insignificant independent predictors of both inflation rates [F statistic is 1.99 with p-value 0.196] and exchange rates [F statistic is 1.09 with p-value 0.444].

The first and second findings of the statistical analysis are interconnected, as there is usually a negative relationship between economic growth rate and unemployment rate especially when economic growth rates are below their potential levels. Thus, if improvement of voice and accountability and control of corruption indicators is able to stimulate economic growth rate to increase; then this may mean a decrease in the rate of unemployment. These two findings are consistent with the attitude of economic growth rate and unemployment rate through periods of political instability illustrated in Figure 10.

The statistical analysis confirmed that fluctuations in inflation rates can't be explained by political changes. The only statistical finding which is inconsistent with observations of Figure 10 is that changes in exchange rates can't be explained by changes in political risk indicators. This finding can be attributed to the nature of sources of foreign exchange in Egypt, such as returns of tourism sector and foreign investment flows, which have been negatively affected by revolutions. These sources of foreign exchange take time to be restored, thus the negative effect resulting from the loss of foreign exchange extends even after regaining of political stability.

In spite that changes in exchange rate of Egyptian pound cannot be explained by changes in political risks' sub-indicators; however, there is a statistically significant negative relationship between depreciation of Egyptian pound exchange rate and political risk index [R-Sq = 36.2% R-Sq(adj) = 30.4%, F statistic is 6.25 with p-value 0.029]. See Appendix 19. Thus, improvement in political risk index is able to appreciate the exchange rate of the Egyptian pound.

The effect of political risk on economic growth revealed a structural problem in the process of economic growth in Egypt. Figure 11 illustrates this structural problem as follows:

- Economic growth is positively related to both voice and accountability and control of corruption indicators; thus, improvement in these two political risks' sub-indicators stimulates economic growth to increase.
- Voice and accountability indicator is highly and positively correlated to three sub-indicators: political stability and absence of violence, regulatory quality and rule of law indicators.
- Both political stability and absence of violence and rule of law indicators are highly and negatively related to control of corruption indicator; thus, spread of corruption reduce the level of risk that is related to political stability and absence of violence and rule of law indicators; and hence improve voice and accountability risk indicator, and ultimately support the process of economic growth.

These findings reflect a paradox and malfunction in the economic growth process in Egypt. On one side, the process of economic growth has a positive direct relationship with control of corruption indicator and at the same time a negative indirect relationship with the same indicator. On the other side, it appears that corruption is pervasive in the structure of the Egyptian economy, as the process of economic growth is supported by spreading of corruption. This may explain why economic growth process in Egypt, even ones with high growth rates, did not manage to turn into a successful economic development process. The negative relationship between control of corruption indicator and average annual return of EGX30 boosts this finding, as spread of corruption promotes annual return on EGX30.

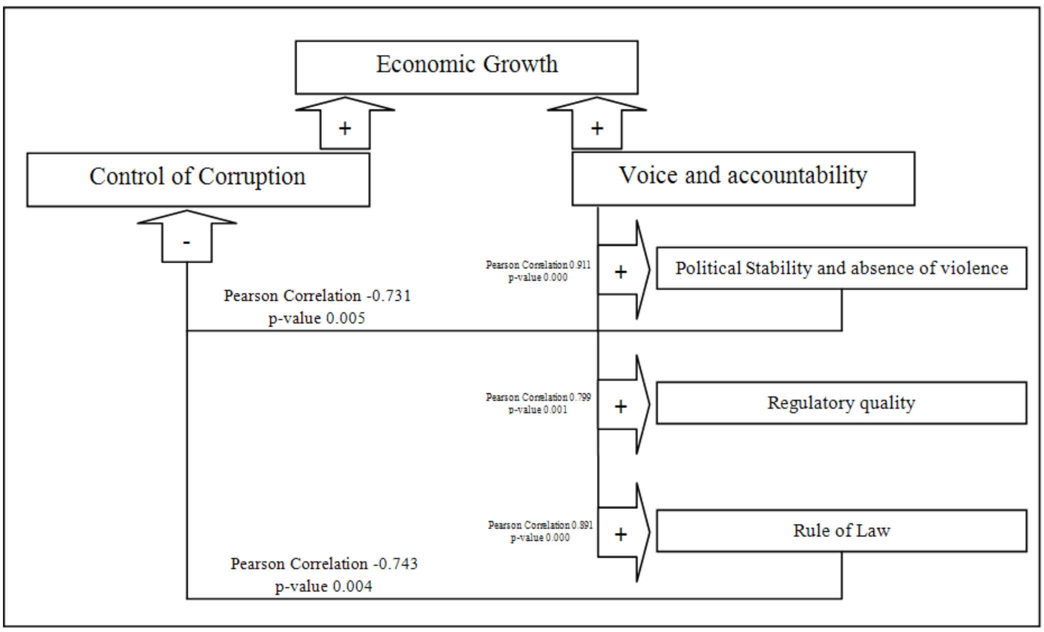


Figure 11. Political risks' sub-indicators and economic growth process in Egypt

Source: Table 1 and Appendix 11.

8. Concluding Remarks

1). Political changes that started in Egypt on 25th of January 2011 have led to deterioration of political risk index of Egypt and increased the level of country risk. This proves the validity of the first hypothesis of the study.

2). Political risks' sub-indicators are highly correlated which makes political risk index more elastic to changes in its sub-indicators.

3). In spite that political risks' sub-indicators are supportive to each other, as they are positively related to each other; however, control of corruption indicator works against all other political risks' indicators, as it is negatively related to political stability and rule of law indicators.

4). Political risk affects Egyptian Exchange in two ways; on one hand, voice and accountability, regulatory quality, and control of corruption indicators are positively related to value of traded stocks. On the other hand, in spite daily returns on EGX30 don't respond to changes in the level of political risk; however, annual returns on EGX30 do respond, as annual returns on EGX30 are negatively related to control of corruption. This proves the validity of the second hypothesis of the study.

5). The effect of political risk on portfolio investment net flows is greater than their effect on foreign direct investment net flows. Moreover, changes in foreign direct investment flows are inelastic to changes in the level of political risk.

6). Net flows of foreign direct investment are positively related to two sub-indicators of political risk index, voice and accountability; and control of corruption.

7). Average domestic interest rate in Egypt tends to increase during periods of internal and external shocks; however, responsiveness of domestic interest rate to internal shocks is relatively greater than its responsiveness to external shocks. Moreover, domestic interest rates are more vulnerable during periods of political changes and financial crises.

8). Interest rate on treasury bills is the most responsive interest rate to political changes, as it tends to increase with high levels of political risk. Political stability and absence of violence is the main indicator of political risk index that explains changes in interest rate on treasury bills, where deterioration of this sub-indicator leads to increase interest rates on treasury bills.

9). Interest rates on government securities are function of risk premiums that mainly result from political instability. This explains the aggravation of domestic public debt and its interest payments in Egypt after January revolution, as domestic debt and interest payments on debt increased by 180% and 171% respectively in the wake of 25th of January revolution. Where deterioration of political stability and absence of violence indicator is responsible for the increase in interest rates on government securities; then it is responsible for aggravation of both domestic public debt and burdens of serving this debt. This proves the validity of the third hypothesis of the study.

10). Changes in the level of political risk is completely responsible for changes in macroeconomic variables either directly or indirectly. Improvement in political risk index, in general, and voice and accountability and control of corruption sub-indicators, in particular, has the power to stimulate economic growth and mitigate unemployment problem. While the effect of political risk on exchange rate can't be explained statistically due to the nature of foreign exchange sources in Egypt; however, it is clear that the increase in level of political risk, as a result of political changes, is the turning point for the decline in foreign exchange earnings and depreciation of Egyptian pound. Because of the strong positive relationship between deterioration of exchange rates and the increase in inflation rates, it can be said that political risk is indirectly responsible for occurrence of price inflation.

11). Spread of corruption is a main backer of the process of economic growth in Egypt, which explains failure of economic growth process to turn into a successful economic development one. This proves the validity of the fourth hypothesis of the study.

Figure 12 summarizes the effect of political risk index and its sub-indicators on Egyptian economy. Political risk affects macroeconomic goals directly and indirectly. The direct effect of political risk on macroeconomic goals is through its effects on economic growth and employment; where the indirect one is through political risk effects on exchange rates, domestic interest rates, domestic public debt, foreign direct investment and Egyptian Exchange.

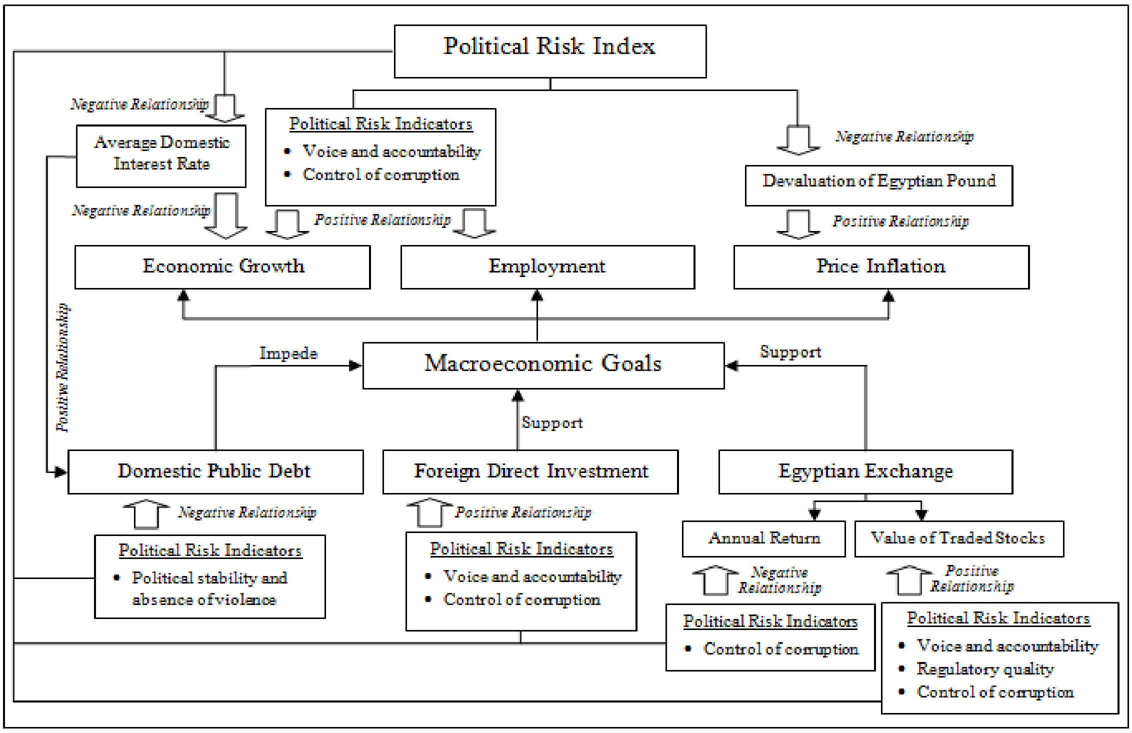


Figure 12. The effect of political risk index and its sub-indicators on the Egyptian economy

9. Research Recommendations

1). Adding new financial instruments to Egyptian financial market such as financial derivatives and stock options, where these financial instruments are able to decrease risks through hedging process.

2). Reactivation of foreign traders' fund transfers, as this has a great effect in facilitating the movement of capital to and from the Egyptian Exchange.

3). Separating military and politics, increasing democracy and controlling corruption have the power to increase foreign direct investment flows, economic growth rate and to alleviate the problem of unemployment.

4). Achieving government stability; mitigating internal and external conflicts, and ethnic and religious tensions have the power to contain inflation of domestic public debt.

5). Improving political risk index, through improving its sub-indicators, may help in restoring sources of foreign exchange and to appreciate Egyptian pound exchange rate which is negatively related to inflation rate.

6). Get rid of the pattern of economic growth that is based on corruption is a must for turning the process of economic growth into a successful economic development process. In this context, fighting against all forms of corruption will be the first step of a successful economic development process; although, this may increase the level of political risk in the short-run. Thus, it is a good chance to fight against corruption during periods of revolutions where the level of political risk is already high, and start a new process of economic growth that support economic development goals.

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Appendix

Appendix 1

Effect of political risks' sub-indicators on annual returns of EGX30

Y= Annul returns on EGX30.

X_6= Control of corruption.

Regression equation after applying stepwise method is					
Y = 366 - 1060 X6					
Predictor	Coef	SE Coef	T	P	
Constant	365.9	109.1	3.35	0.006	
X6	-1060.1	351.7	-3.01	0.012	
S = 48.7694	R-Sq = 45.2%	R-Sq(adj) = 40.3%			
Analysis of Variance					
Source	DF	SS	MS	F	P
Regression	1	21610	21610	9.09	0.012
Residual Error	11	26163	2378		
Total	12	47773			

Appendix 2

Effect of political risks' sub-indicators on the value of traded stocks

Y= Values of traded stocks.

X_1= Voice and accountability.

X_6= Control of corruption.

Regression equation after applying stepwise method is

$Y = - 1.04E+12 + 8.63E+11\ X_1 + 2.86E+12\ X_6$

Predictor	Coef	SE Coef	T	P
Constant	-1.04110E+12	1.52770E+11	-6.81	0.000
X_1	8.63307E+1	1.65865E+11	5.20	0.000
X_6	2.85963E+12	3.63076E+11	7.88	0.000
S = 42399620605	R-Sq = 86.4%	R-Sq(adj) = 83.6%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	1.13841E+23	5.69206E+22	31.66	0.000
Residual Error	10	1.79773E+22	1.79773E+21		
Total	12	1.31818E+23			

Appendix 3

Responsiveness of foreign traders (Arabs) in stock market to political risks' sub-indicators

Y= Values of traded stocks by Arabs.

X_1= Voice and accountability.

X_6= Control of corruption.

Regression equation after applying stepwise method is

$Y = - 1.17E+11 + 1.11E+11\ X_1 + 2.98E+11\ X_6$

Predictor	Coef	SE Coef	T	P
Constant	-1.17078E+11	19354975306	-6.05	0.000
X_1	1.11018E+11	21014054262	5.28	0.000
X_6	2.97751E+11	45999503984	6.47	0.000
S = 5371764996	R-Sq = 82.3%	R-Sq(adj) = 78.7%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	1.33971E+21	6.69855E+20	23.21	0.000
Residual Error	10	2.88559E+20	2.88559E+19		
Total	12	1.62827E+21			

Appendix 4

Responsiveness of foreign traders (Non-Arabs) in stock market to political risks' sub-indicators

Y= Values of traded stocks by non-Arabs foreigners.

X_1= Voice and accountability.

X_6= Control of corruption.

Regression equation after applying stepwise method is

$Y = - 1.87E+11 + 1.48E+11\ X_1 + 5.23E+11\ X_6$

Predictor	Coef	SE Coef	T	P
Constant	-1.86675E+11	32743594923	-5.70	0.000
X_1	1.47695E+11	35550325928	4.15	0.002
X_6	5.23113E+11	77819222256	6.72	0.000
S = 9087632211	R-Sq = 82.0%	R-Sq(adj) = 78.4%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	3.76441E+21	1.88221E+21	22.79	0.000
Residual Error	10	8.25851E+20	8.25851E+19		
Total	12	4.59026E+21			

Appendix 5

Responsiveness of Egyptian traders in stock market to political risks' sub-indicators

Y= Values of traded stocks by Egyptians.

X_4= Voice and accountability.

X_6= Control of corruption.

Regression equation after applying stepwise method is

Y = - 1.62E+12 + 2.42E+12 X_4 + 1.76E+12 X_6

Predictor	Coef	SE Coef	T	P
Constant	-1.61941E+12	2.86689E+11	-5.65	0.000
X_4	2.41764E+12	5.08245E+11	4.76	0.001
X_6	1.76458E+12	2.53070E+11	6.97	0.000
S = 32671233838	R-Sq = 84.4%	R-Sq(adj) = 81.3%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	5.79153E+22	2.89577E+22	27.13	0.000
Residual Error	10	1.06741E+22	1.06741E+21		
Total	12	6.85894E+22			

Appendix 6

Effect of political risks sub-indicators on foreign direct investment net flows

Y= Net flows of foreign direct investment.

X_1= Voice and accountability.

X_6= Control of corruption.

Regression equation after applying stepwise method is

Y = - 39244 + 34492 X_1 + 103489 X_6

Predictor	Coef	SE Coef	T	P
Constant	-39244	7017	-5.59	0.000
X_1	34492	7619	4.53	0.001
X_6	103489	16678	6.21	0.000
S = 1947.61	R-Sq = 80.2%	R-Sq(adj) = 76.2%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	153510298	76755149	20.24	0.000
Residual Error	10	37931768	3793177		
Total	12	191442066			

Appendix 7

Effect of political risks sub-indicators on changes in foreign direct investment net flows

* X3 is (essentially) constant

* X3 has been removed from the equation (government effectiveness).

Y= Changes in foreign direct investment net flows.

X_1= Voice and accountability.

X_2= Political stability and absence of violence.

X_4= Regulatory quality.

X_5= Rule of law.

X_6= Control of corruption.

Regression equation is

Y = - 12115 - 1779 X_1 + 18367 X_2 + 701 X_4 - 8035 X_5 + 11469 X_6

Predictor	Coef	SE Coef	T	P
Constant	-12115	43018	-0.28	0.786
X_1	-1779	33289	-0.05	0.959
X_2	18367	54994	0.33	0.748
X_4	701	92259	0.01	0.994
X_5	-8035	66985	-0.12	0.908
X_6	11469	44880	0.26	0.806
S = 3546.59	R-Sq = 10.0%	R-Sq(adj) = 0.0%		

Analysis of Variance					
Source	DF	SS	MS	F	P
Regression	5	9771298	1954260	0.16	0.971
Residual Error	7	88048205	12578315		
Total	12	97819503			

Appendix 8

Effect of political risks sub-indicators on portfolio investment net flows

* X_3 is (essentially) constant

* X_3 has been removed from the equation (government effectiveness).

Y= Portfolio investment net flows.

X_1= Voice and accountability.

X_2= Political stability and absence of violence.

X_4= Regulatory quality.

X_5= Rule of law.

X_6= Control of corruption.

Regression equation is

$Y = -87434 - 47926 X_1 - 78690 X_2 + 152305 X_4 + 146509 X_5 + 9350 X_6$

Predictor	Coef	SE Coef	T	P
Constant	-87434	46238	-1.89	0.101
X_1	-47926	35781	-1.34	0.222
X_2	-78690	59110	-1.33	0.225
X_4	152305	99165	1.54	0.168
X_5	146509	71998	2.03	0.081
X_6	9350	48239	0.19	0.852
S = 3812.04	R-Sq = 47.3%	R-Sq(adj) = 9.7%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	91389432	18277886	1.26	0.377
Residual Error	7	101721800	14531686		
Total	12	193111232			

Appendix 9

Effect of political risks sub-indicators on changes in portfolio investment net flows

* X_3 is (essentially) constant

* X_3 has been removed from the equation (government effectiveness).

Y= Changes in portfolio investment net flows.

X_1= Voice and accountability.

X_2= Political stability and absence of violence.

X_4= Regulatory quality.

X_5= Rule of law.

X_6= Control of corruption.

Regression equation is

$Y = -141992 - 49848 X_1 - 218966 X_2 + 288363 X_4 + 311711 X_5 + 2166 X_6$

Predictor	Coef	SE Coef	T	P
Constant	-141992	63428	-2.24	0.060
X_1	-49848	49084	-1.02	0.344
X_2	-218966	81086	-2.70	0.031
X_4	288363	136032	2.12	0.072
X_5	311711	98766	3.16	0.016
X_6	2166	66173	0.03	0.975
S = 5229.27	R-Sq = 64.0%	R-Sq(adj) = 38.3%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	340536767	68107353	2.49	0.133
Residual Error	7	191416905	27345272		
Total	12	531953672			

Appendix 10

Relationship between interest rate on short-term loans and political risks' sub-indicators

Y= Interest rate on short-term loans.

X_2= Political stability and absence of violence.

Regression equation after applying stepwise method is

$Y = 6.94 + 7.28\ X_2$

Predictor	Coef	SE Coef	T	P
Constant	6.939	1.069	6.49	0.000
X_2	7.276	1.402	5.19	0.000
S = 0.492648	R-Sq = 71.0%	R-Sq(adj) = 68.4%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	6.5402	6.5402	26.95	0.000
Residual Error	11	2.6697	0.2427		
Total	12	9.2099			

Appendix 11

Relationship between interest rate on deposits at post office and political risks' sub-indicators

Y= Interest rate on deposits at post office.

X_6= Control of corruption.

Regression equation after applying stepwise method is

$Y = 15.5 - 19.1\ X_6$

Predictor	Coef	SE Coef	T	P
Constant	15.5333	0.8235	18.86	0.000
X_6	-19.133	2.656	-7.20	0.000
S = 0.368291	R-Sq = 82.5%	R-Sq(adj) = 80.9%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	7.0401	7.0401	51.90	0.000
Residual Error	11	1.4920	0.1356		
Total	12	8.5321			

Appendix 12

Relationship between interest rate on treasury bills and political risks' sub-indicators

Y= Interest rate on treasury bills.

X_2= Political stability and absence of violence.

Regression equation after applying stepwise method is

$Y = 21.3 - 15.2\ X_2$

Predictor	Coef	SE Coef	T	P
Constant	21.317	2.871	7.42	0.000
X_2	-15.153	3.763	-4.03	0.002
S = 1.32270	R-Sq = 59.6%	R-Sq(adj) = 55.9%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	28.367	28.367	16.21	0.002
Residual Error	11	19.245	1.750		
Total	12	47.612			

Appendix 13

Effect of political risk on domestic public debt

Y= Domestic public debt.

X_2= Political stability and absence of violence.

Regression equation after applying stepwise method is

$Y = 3939 - 4110 X_2$

Predictor	Coef	SE Coef	T	P
Constant	3939.4	440.8	8.94	0.000
X_2	-4110.3	577.8	-7.11	0.000
S = 203.073	R-Sq = 82.1%	R-Sq(adj) = 80.5%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	2087134	2087134	50.61	0.000
Residual Error	11	453624	41239		
Total	12	2540758			

Appendix 14

Effect of political risk on interest payments on domestic public debt

Y= Interest payments on domestic public debt.

X_2= Political stability and absence of violence.

Regression equation after applying stepwise method is

$Y = 374 - 408 X_2$

Predictor	Coef	SE Coef	T	P
Constant	373.68	50.21	7.44	0.000
X_2	-408.27	65.81	-6.20	0.000
S = 23.1322	R-Sq = 77.8%	R-Sq(adj) = 75.7%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	20593	20593	38.48	0.000
Residual Error	11	5886	535		
Total	12	26479			

Appendix 15

Effect of political risks' indicators on economic growth

Y= Economic growth rate.

X_1= Voice and accountability.

X_6= Control of corruption.

Regression equation after applying stepwise method is

$Y = -16.4 + 24.3 X_1 + 38.4 X_6$

Predictor	Coef	SE Coef	T	P
Constant	-16.415	3.069	-5.35	0.000
X_1	24.298	3.332	7.29	0.000
X_6	38.351	7.293	5.26	0.000
S = 0.851717	R-Sq = 84.8%	R-Sq(adj) = 81.7%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	40.375	20.188	27.83	0.000
Residual Error	10	7.254	0.725		
Total	12	47.629			

Appendix 16

Effect of political risks' indicators on unemployment

Y= Unemployment rate.

X_1= Voice and accountability.

X_6= Control of corruption.

Regression equation after applying stepwise method is

$Y = 23.0 - 18.0\ X_1 - 18.5\ X_6$

Predictor	Coef	SE Coef	T	P	
Constant	22.952	3.444	6.66	0.000	
X_1	-18.026	3.739	-4.82	0.001	
X_6	-18.514	8.186	-2.26	0.047	
S = 0.955897	R-Sq = 70.1%	R-Sq(adj) = 64.1%			

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	21.380	10.690	11.70	0.002
Residual Error	10	9.137	0.914		
Total	12	30.517			

Appendix 17

Effect of political risks' indicators on price inflation

* X3 is (essentially) constant

* X3 has been removed from the equation.

Y= Inflation rate.

X_1= Voice and accountability.

X_2= Political stability and absence of violence.

X_4= Regulatory quality.

X_5= Rule of law.

X_6= Control of corruption.

Regression equation is

$Y = 14.9 + 7.2\ X_1 + 40.9\ X_2 - 1.6\ X_4 - 78.3\ X_5 + 26.7\ X_6$

Predictor	Coef	SE Coef	T	P	
Constant	14.88	30.06	0.49	0.636	
X_1	7.20	23.27	0.31	0.766	
X_2	40.89	38.43	1.06	0.323	
X_4	-1.61	64.48	-0.02	0.981	
X_5	-78.27	46.81	-1.67	0.138	
X_6	26.74	31.37	0.85	0.422	
S = 2.47865	R-Sq = 58.8%	R-Sq(adj) = 29.3%			

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	61.283	12.257	1.99	0.196
Residual Error	7	43.006	6.144		
Total	12	104.289			

Appendix 18

Effect of political risks' indicators on exchange rate

* X3 is (essentially) constant

* X3 has been removed from the equation.

Y= Exchange rate.

X_1= Voice and accountability.

X_2= Political stability and absence of violence.

X_4= Regulatory quality.

X_5= Rule of law.

X_6= Control of corruption.

Regression equation is

Y = 5.13 - 3.38 X1 - 5.47 X2 + 13.6 X4 + 1.5 X5 - 4.78 X6

Predictor	Coef	SE Coef	T	P
Constant	5.132	7.644	0.67	0.524
X_1	-3.376	5.915	-0.57	0.586
X_2	-5.474	9.772	-0.56	0.593
X_4	13.64	16.39	0.83	0.433
X_5	1.50	11.90	0.13	0.903
X_6	-4.781	7.975	-0.60	0.568
S = 0.630211	R-Sq = 43.7%	R-Sq(adj) = 3.4%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	2.1549	0.4310	1.09	0.444
Residual Error	7	2.7802	0.3972		
Total	12	4.9351			

Appendix 19

Effect of political risk index on exchange rate

Y= Exchange rate.

X_1= Political risk index.

Regression equation is

Y = 10.6 - 9.45 X_1

Predictor	Coef	SE Coef	T	P
Constant	10.592	1.897	5.58	0.000
X_1	-9.448	3.779	-2.50	0.029
S = 0.534844	R-Sq = 36.2%	R-Sq(adj) = 30.4%		

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	1.7885	1.7885	6.25	0.029
Residual Error	11	3.1466	0.2861		
Total	12	4.9351			

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FDI-Local Investment Nexus: Evidence from MENA Region

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Abstract

The aim of this article is to measure the interactions likely to occur between Foreign Direct Investment and the local investment in the MENA region. This interaction could take the shape of either a substitution or a complementarity relationship. We have adopted an empirical analysis based on panel data using a sample of 7 countries (Tunisia, Algeria, Morocco, Egypt, Jordan, Lebanon and Syria). We have concluded that the most probable assumption for these countries is the eviction of the local investment projects following the entry of FDI.

Keywords: foreign direct investment, mena region, panel data

1. Introduction

Debates on foreign direct investments link these flows to a series of benefits for the host country. Indeed, FDI have become a part of an open and efficient international economic system. They are even more desired in developing countries since they are perceived as one of the main catalysts of development factor, a complement of the national investment and a source of financing of the current account deficit. The focus is not so far centered on the direct effects but rather on the technological dimension generated by these investment flows. In fact, for many developing countries which do not enjoy technological advantage, the implantation of a foreign technology appears to be a substitute or a complement to the development of national research activities that these emerging countries are not able to bear the associated expenses.

All these issues have been extensively treated both by the economic literature and the empirical studies leading to rather positive findings regarding the effects of FDI on the economies of the host countries. However, the problem of the relationship between FDI and the local investment has not received as much interest despite its importance. The theoretical studies are not numerous enough and the empirical applications have come to conflicting results. The aim of this paper is then to test empirically, using a sample of 7 countries of the MENA region, the hypothesis according to it FDI contribute to increase the stock of the capital in the host country (Note 1). We have been compelled to reduce the sample size to only 7 countries for data availability reasons. It’s worth mentioning that, to the best of our knowledge, there are no studies which have addressed the link between FDI and local investment in this region. We have then targeted the MENA region to try to shed some light on this issue. We will deal with the question of the interaction between FDI and the local investment from the perspective of the gross fixed capital formation. Our purpose is to investigate whether FDI stimulate or discourage the local investment.

2. The Relationship between FDI and the Local Investment: A Literature Overview

Despite the numerous studies on FDI, the question of the interaction between these flows and the local investment has not received as much interest. Indeed, theoretical studies are rather few and the empirical applications have come to contradictory findings.

Markusen and Venables (1999) conceptualized this interaction via a partial equilibrium model. They considered two sectors of imperfect competition, bound by an input-output structure. The entrance of the multinationals in the final goods sector have increased competition and crowded out the local firms. However, thanks to the upstream externalities, the foreign companies are stimulating the industrial development of the intermediaries’ goods sector. Such complementarities can also generate second order profits for the downstream companies.

Based on the hypothesis that the subsidiaries are created in the upstream sectors, Barrios et al. (2005), developed a similar theoretical model in which they demonstrated that an eviction of the local companies has been noted on the short term as a consequence to the decline of the final goods prices. However, this effect is balanced by the stimulation of the request towards the upstream sector in the long term.

The findings of these works are rather optimistic arguing for a stimulating impact of FDI on the long term. Nevertheless, there is a restrictive assumption for the two models dealing with the procurement of intermediate goods from the local market. Actually, some inputs are imported by multinational according to the tariff barriers, to the distance from the countries of origin…

Backer (2003) asserted that many potential entrepreneurs waive up to set up their own businesses preferring working for the account of the foreign companies. What distinguishes the work of Backer is the fact that the eviction impact is led by the employment market instead of the traditional channels of the real and financial markets.

Based on a sample of 36 countries, Agosin and Machado (2005) came to different findings. They asserted that FDI have a crowding out effect for the Latin America countries whereas they seem not to impact the local investment in both Asian and African countries.

Empirically, the question of the effect of FDI on the dynamics of local investment has been marginally addressed in works concerned with economic growth. Borensztein et al. (1998) demonstrated the negative effect of FDI on local investment in Latin America. They asserted that FDI have rather technological externalities than a significant impact on the capital stock. Agosin and Machado (2005) affirm that the crowding out effect was only remarked in developed countries. By calculating a long-term coefficient in order to determine a dynamic effect, Mody and Murshid (2005) have shown that beyond the short-term drawbacks, FDI stimulate the local investment on the long-term .

Through a 22 countries sample of the Eastern Europe, Mileva (2008) have concluded that FDI stimulate the local investment only for the countries renowned by both a weak institutional development and financial systems.

Wang (2010) and Morrissey and Udomkerdmongkol (2012) have found a substitution effect on the local investment. Wang (2010) calculated an additive effect, indicating that even when a foreclosure phenomenon is noted, it certainly disappears after three years of entry of FDI.

Morrissey Udomker Mongkol (2012) approached the issue from the perspective of the political and the economic governance regime. They have established that the relationship between FDI and local investment is as much significant as the economic governance is efficient.

This literature review exposes the great divergence between the different findings which stem from the differences in the characteristics of the sample considered, the utilized variables and the methodology estimation. Our study aims at contributing to the debate and throwing some light upon the issue.

3. The Research Methodology

3.1 The Empirical Specification

According to the theoretical expectations mentioned above, the process of Investment will be approached through a process of adjustment between the existing capital stock and the stock desired (for this reason, we will introduce the lagged dependent variable). However, we have to take into account the fact that the adjustment is partially achieved because of the liquidity constraints and the access to the funding as well as the temporal adjustments. Taking the works of Mody and Murshid (2005) as our main reference, we will estimate the contribution of FDI in the local investment through an investment function increased by the inclusion of multiple determinants as below:

$$GFCF_{it} = f\ (GFCF_{i,t-1}\ , FDI_{it}\ , C_{it}\ , GROWTH_{i,t-1}\ , RINT_{it}\ , Z_{it}) \tag{1}$$

GFCF: the Gross fixed capital formation as a percentage of the GDP (the investment rate), the lagged dependent variable $GFCF_{t-1}$ considers the persistence of the investment rate. Being a structural component of the economy, we expect the investment to have a strong autoregressive character. The lagged variable $GFCF_{t-1}$ highlights the dynamic nature of the relationships and allows- at the same time- the calculation of the long-run coefficients. It allows considering the process of adjustment between the existing capital stock and the one desired.

FDI: the net flows of foreign international investment as a percentage of the GDP. This variable is the proxy used for the real investment made by foreign subsidiaries

C_{it}: the vector of capital flows other than FDI. We consider here the portfolio investment (PF) and the external debts (ED). Both of these flows are expressed as a percentage of the GDP. We introduced these variables in order to compare the contribution of these types of flows in the determination of the local investment. FDI have several theoretical advantages compared with other types of capital. Compared to portfolio investments, FDI, are by definition, long-run commitments. They, therefore, are more stable and react more slowly to the market fluctuations. We also limit the foreign credits to those of long-run, to be more similar to FDI. However, these loans depend much more on the global financial conditions than FDI.

$$C_t = \begin{pmatrix} PF \\ ED \end{pmatrix}$$

Regarding the investment classic determinants, we include the accelerator investment and the cost of capital. Their expected influence is described below:

GROWTH: Real growth of GDP, delayed by a period to consider the accelerating effect as the future investment is dependent on the growth today.

The real interest rate RINT is a proxy of the cost of capital. We expect a negative correlation with the rate of investment. Although most studies have used the short-term interest rate, we consider more relevant an investment function estimating based on long-run interest rates. To determine the real cost of capital, we deducted the inflation rate from the nominal interest rate.

Z_{it}: the vector of the control variables including the other determinants of investment. Their introduction is essential to avoid an over-estimation of the interest variables coefficients and also to check the robustness of the results. Inspired by (Mody & Murshid, 2005; Wang, 2010) works, we have retained the terms of trade, the inflation rate, and the trade openness.

$$\text{Zt} = \begin{pmatrix} TT \\ INF \\ TO \end{pmatrix}$$

TT: the terms of trade as a proxy for the relative price of capital goods imported compared to the export price. We use this variable as a proxy for the relative price of the imported capital goods compared to the export price. Thus, an increase of this ratio shows that exports are relatively more expensive than imports, which leads to a rise in the purchasing power thanks to the export revenues. Regarding the capital goods imports, we expect that an increase in the terms of trade positively impacts the investment. If, however, imports contain mainly consumer goods, the effect on the accumulation of capital remains very low.

INF: the inflation rate in order to measure the economic instability.

TO: the trade openness (calculated as the share of foreign trade in GDP) as an investment incentive factor. We expect that a high degree of open trade encourages investment, especially in exporters sectors.

Our data are extracted from the World Bank Data Base and the International financial statistics Data Base. We referred to the period between1993-2014. The data base was organized in the form of an unbalanced panel with 7 countries observed from the MENA region. The analyzed countries are Tunisia, Algeria, Morocco, Egypt, Jordan, Lebanon and Syria.

To test the substitution/complementary effect of FDI on the local investment, our interest is to compare the coefficient of FDI to 1. A coefficient of 1 means that the increase in FDI flows will fully be found in the fixed capital formation. A lower coefficient of 1 indicates a negative effect of excluding, while a coefficient greater than 1 is interpreted as a stimulating local investment (Agosin, Machado, Mody, & Murshid, 2005).

Theoretical models (Markusen & Venables, 1999) suggest an influence of FDI in two stages, namely an initial effect of substitution, followed by a complementary effect in the long-run. However, in a different context, Aghion and Howitt (1992) have called this effect the “creative destruction”. Then, the combination of the effects of FDI on two time horizons allows us to identify four assumptions according to Lahimar (2009), summarized in Table 1. We note that there is also the possibility that the long-run elasticity would not be significant (or equal to zero). If so, the below assumptions will be reduced to two: substitution or complementarity.

Table 1. Assumptions about the relationship between FDI and the local investment

	Short-run	Long-run	Effect
A1	$\omega_{sr}<1$	$\omega_{lr}<1$	substitution
A2	$\omega_{sr}<1$	$\omega_{lr}>1$	creative destruction
A3	$\omega_{sr}>1$	$\omega_{lr}<1$	transitory stimulation
A4	$\omega_{sr}>1$	$\omega_{lr}>1$	complementarity

In the empirical study, we seek to validate one of these theoretical assumptions. To this end, we will separate analysis based on the horizon time: the short-run and the long-run.

Table 2. The descriptive statistics of the main variables

Variable	Obs	Mean	Std. Dev.	Min	Max
gfcf	154	24.3196	4.9702	13.27049	38.23645
fdi	154	3.230948	4.023175	-.5984143	23.53736
pf	154	1.351676	5.070842	-4.577	51.21
ed	153	57.53941	40.0603	2.49	206.85
growth	154	3.633688	4.390877	-21.34	13.45978
rint	154	2.860386	15.61107	-121	21.56904
tt	154	95.75022	24.65782	35.47	154.68
inf	154	7.029238	16.00078	-3.846154	150
to	154	70.18895	18.99453	38.36	133.5

Looking at the Table 2, we note however that the role of FDI in the international flows of capital does not mean quite large relative to the external debts. Aalthough we expect a significant correlation between foreign investment flows and the local investment, it seems at the first glance that the foreign flows still remain below expectations which makes us wonder about the attractiveness of these countries. This could be explained by the effect of the global recession, the socio-political revolution that has erupted in some countries as well the deteriorated security situation and the lack of medium and long term economic visibility.

We note furthermore the high value of the external debts which represent most of the time more than 50% of the GDP. This reflects the weakness of the evolution of the growth compared to the debt. The governments' indebtedness' have been up in a context marked by an increase in the current budgetary expenditure while that of the other non-financial economic agents relates the persistent investors' skepticism.

3.2 The Generalized Method of Moment (GMM)

As a general empirical approach, we have preferred the panel estimation techniques, having many advantages in our case. Indeed, the panel combines the temporal and inter-dimension data and provides more variability. Thus, it has a higher number of degrees of freedom and reduces the collinearity between the explanatory variables (Hsiao, 2003).

The dynamic structure of the equation (1), which results from the presence of the lagged dependent variable $GFCF_{t-1}$, raises problems related to the application of the LSE method. We have to note that the introduction of the lagged dependent variable is essential for theoretical reasons, but also because it has the technical advantage to control the risk of the omitted variables. However, in an autoregressive model, so LS estimator than Within, Between or the LS generalized are no longer convergent.

The problem of non-convergence of the LS estimators is explained mainly by two phenomena: The first concern is the biases of the dynamic panel (Nickel, 1981). The variable $GFCF_{i,\,t-1}$ is correlated with the individual fixed effects, giving rise to the autocorrelation of the residues. The second problem appears when certain explanatory variables are endogenous. Since the causality is verified in both directions, the variables could be correlated with the residue violating again the LSE assumptions. An example related to our problematic is the fact that FDI can be attracted by high rates of growth, while remaining themselves a determinant of growth.

The efficient estimation of a dynamic panel is possible using the GMM as it allows to correct the endogeneity of the autoregressive variables and to determine the efficient parameters even in the presence of endogenous explanatory variables. The major advantage over the conventional techniques of instrumental variables is the generation of internal instruments. In practice, the lagged values of the variables are instruments to explain their present values.

It should be mentioned that this method can only correct the endogeneity in the weak sense, but not strong endogeneity. It assumes that some of the explanatory variables are predetermined; they may be affected by both past and present achievements of the dependent variable, but not by its future achievements. We consider relevant to illustrate this hypothesis with an application to the case of FDI. If we consider the FDI flows as a predetermined variable, then we assume that the decisions of foreign investors are not independent of both past and present developments macroeconomic in host countries. This hypothesis is highly plausible indeed. However, Carkovic and Levine (2005) argue that this assumption does not exclude foreigners' investors' expectations of the future evolution of the economic situation. It just says that unanticipated future shocks do not affect the current level of FDI.

According to the construction principle of a GMM estimator, here is the equation reflecting a homogeneous dynamic panel with individual fixed effects:

$$y_{it} = \lambda_0 + \lambda_1 + \alpha y_{i,t-1} + \omega X_{it} + \varepsilon_{it} \quad (2)$$

y_{it} indicates the dependent variable (GFCF), X_{it} is the vector of explanatory variables, λ_0 is a constant, λ_1 reflects the individual fixed effects and ε_{it} is the residue. The presence of the autoregressive term is justified by the adjustment phenomena, the consideration of the expectations and the hysteresis of the macroeconomics variables.

To eliminate the individual fixed effects, we resort to the differentiation (Arellano & Bond):

$$y_{it} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \omega(X_{it} - X_{it-1}) + \varepsilon_{it} - \varepsilon_{it-1} \quad (3)$$

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \omega \Delta X_{it} + \Delta \ \varepsilon_{it}$$

Although the differentiation allows to eliminating the individual fixed effects, it does not remove the problem of correlation between the new residual term $\varepsilon_{it} - \varepsilon_{it-1}$ and the lagged dependent variable $y_{it} - y_{i,t-1}$. To remedy to this issue, Arellano and Bond (1991) propose to instrument the differences (of both the lagged dependent variable and the explanatory ones) with the past values of the same variables. This cancels out the Explanatory variables correlation with the current residue but keeps the correlation with the past residue.

Concerning, the number of instruments, Chatelain (2007) have proposed a theoretical procedures for the selection of the appropriate moments. However, taking into account the reduced size of our sample, we are obliged to reduce the number of the instruments. Indeed, multiplying exponentially the number of instruments weakens the power of the Sargan test. Since the lags of one period are, by construction correlated with residues, it is necessary to include delays of at least two periods. We have tested the inclusion of the higher order delays but this makes the estimations unstable and the Sargan test rejects the validity of these instruments. Consequently, we have limited the instruments at the second delay of the dependent variable. We then have instrumented the lagged investment (GFCF) by its own delayed values.

We have also to take into our consideration that the causality between the capital flows and the local investment could interact in both directions. In order to verify the necessity of the instrumentation of these three capital flows, the test of exogeneity of Davidson-MacKinnon (1993) is very useful. Indeed, the test has revealed that these variables are endogenous confirming the existence of a relationship between capital flows and the local investment, and then the necessity to use instrumental variables. Therefore, we have also instrumented these variables (FDI, PF, ED) with their lags.

Table 3. Davidson-MacKinnon test

Variables	Davidson-MacKinnon test	P -value
FDI	3,75	0,0317
PF	4,15	0,0157
ED	3,97	0,0231

H0: the explanatory variables are exogenous.

H1: the explanatory variables are endogenous.

The efficiency of the GMM estimator is based on the validation of two hypotheses, the exogeneity of the instruments and the non-correlation of the residuals. The validity of the instruments is checked using Hansen/Sargan tets (built on the assumption that the error term should not be correlated with the set of exogenous variables if the instruments are valid) and the autocorrelation residue is tested by a test proposed by Arellano and Bond (built on the null hypothesis of no autocorrelation and implemented to the differenced residuals). It should be noted that the construction of the differences in equation (3) introduces a first order autocorrelation. Verifying the autocorrelation of the residues is then made from the second order. The test Arellano and Bond AR (2) accepts the null hypothesis of the absence of autocorrelation of second order in the residuals. Sargan test accepts the hypothesis of the validity of the instruments.

Although these estimators are based on the quasi-stationarity, in practice, this assumption tends to be ignored.

First, the GMM is designed for relatively short time series (in fact this is the main reason for using a panel). Thus, the stationary series can be hardly evaluated. Second, the GMM consists in transforming the original equation in differences, which leads to the disappearance of any possible non-stationary variables trends. Besides, most of the variables used should theoretically be stationary. The investment rate (GFCF/GDP), for example, can record short-term changes, but it is limited in its long-term development. (As a share of income, it could not display a permanent upward or down-ward trend). However, we have tested the stationarity of the series before the estimation. We have used the Levin- Lin-Chu unity root test which has revealed the absence of a non-stationarity problem in our series.

Table 4. The Levin- Lin-Chu unity root test

	Statistic	p-value
Unadjusted t	-5.6315	
Adjusted t*	-2.4756	0.0067

4. Empirical Results

The equation estimated is as follows:

$$GFCF_{it} = \alpha GFCF_{i,t-1} + \omega_1 GROWTH_{i,t-1} + \omega_2 FDI_{it} + \omega_3 C_t + +\omega_4 RINT_{it} + \omega_5 Z_{it} + \nu_i + \varepsilon_{it} \quad (4)$$

With $i = 1, \ldots, 7$ represent the country index; t= 1993… 2014 is the considered period; ν_i are the individual fixed effects with consider to the countries and ε_{it} are the idiosyncratic residues.

Table 5. The contribution of FDI on the local investment

Arellano-Bond dynamic panel-data estimation						
gfcf |	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
gfcf |						
L1. |	.6864232	.0417656	16.44	0.000	.6045642	.7682823
growth |						
L1. |	.065545	.0516582	1.27	0.205	-.0357032	.1667932
fdi |	.0995535	.0577648	1.72	0.087	-.0147272	.2138341
pf |	-.023548	.029266	-0.80	0.421	-.0809083	.0338122
ed |	-.0124985	.0056113	-2.23	0.026	-.0234965	-.0015005
tt |	-.0408176	.0092305	-4.42	0.000	-.0589091	-.0227262
rint |	.1895225	.0287127	6.60	0.000	.1332466	.2457984
inf |	.1544091	.0271828	5.68	0.000	.1011318	.2076864
to |	.0785955	.0124745	6.30	0.000	.054146	.103045
cons |	4.681379	1.695419	2.76	0.006	1.358418	8.00434
AR(1)						**0.001**
AR(2)						**0.383**
sargan stat						0.339
sargan p-value						0.507

We will first discuss the coefficients obtained for the main variables, to focus later on the influence of FDI on the dependent variable. The results confirm that the gross fixed capital formation has a significant structural component (0<0.05). Such a result was expected. It is indeed the engine that drives the wheels of the economic machine by allowing entrepreneurs to raise the necessary resources to produce goods and services. Rapid and sustained growth is promoted by a favorable conjunction in which entrepreneurship and investment induce higher productivity, which in turn allows more investment in the future.

Besides, among the classical determinants, the interest rate is significant (0<0, 05) in contrast with the studies incorporating the interest rates which have got inconclusive results (Mody & Murshid, 2005; Agrawal, 2005; Wang, 2010). This might be due to the specifications of the studied countries. Being developing ones, the interest rate is among the most determinant factors of the investment. Indeed, investors who are often looking for short term profit and prone to herd behavior, are susceptible to a variety of factors including mainly the interest rate. Starting from the fact that the investment function is typically decreasing in relation to interest rates, we have expected a negative correlation between the interest rate and the local investment. The calculated coefficient is however positive (0.18). How to interpret such a result? The answer is given by Mankiw (2009) who argues that the relation between the interest rate and the investment depends on the origin of the variation of the interest rate. Studying the relationship between the investment and the interest rate, he concluded that the nature of the correlation deeply depends on the variable that has been modified. When the saving function moves under the effect of the fiscal policy, the correlation between the investment and the interest rate tends to be negative. However, the increase in the investment demand -following to the potential impact of technological innovations or a fiscal investment incentive- raises the interest rate. Hence, the investment volume increases only if the interest rate increases.

The growth rate does not appear to be a stimulating factor (0.205>0.05). This could be explained by the importance of the socio psychological dimension of the investment decision not only linked to a high growth rate but above all to the sustainability of this growth. Indeed, the level of confidence or fear in the future strongly impacts the investors' decision. Under the cumbersome administrative procedures that have always prevailed in the business climate of these countries combined with the little precarious political and security contexts that characterizes most of them (the post revolution transitional period for Tunisia & Egypt, the war in Syria, the civil war in Lebanon), it is expectable that the growth rate appears as a non-significant variable.

The portfolio investments do not affect the local investment, they display a non-significant coefficient (0.421>0, 05). This is mainly due to the fact that the immediate goal of portfolio investors- apart the fact of their weak value- is to get a financial gain, being interested in the distribution of profits rather than their reinvestment. Indeed, their main motivation is the portfolio diversification, not the productive investments. Another explanation is linked to the fact that the financial markets in the region are not enough developed, which limits the potential contribution to the fixed capital formation. Finally, Portfolio investments are more volatile compared to the other international capital flows. Their instability may well harm the productive investments and affect growth prospects.

Regarding the external debts, the situation is much more complicated. Despite a significant coefficient (0,026), the value reflects a negative correlation (-0.012). The foreign loans have been most of the times diverted from their original purpose. Indeed, they have not been intended to finance the investment but rather wasted on financing the administrations of the dictatorships, funding strictly the circles of the power with the aim of monopolizing the countries' economies. All these factors have contributed to degrade the business climate. Resorting to external borrowing to pay salaries of civil servants, fund administration or make investments that do not generate exports have been an economic suicide that has resulted in irreversible budget deficit for all the countries studied.

Regarding the role of foreign direct investment (FDI), a first observation refers to their overall positive contribution to capital accumulation. Thus, an increase in FDI flows of 1% of the GDP leads to an increase of approximately 0.099% of the gross fixed capital formation. The value obtained is much smaller than 1, confirming thus a substitution effect for the local investment. At least in the short term, the increasing competition generated by the entry of the foreign subsidiaries would have a negative effect on the local investment. This effect could reflect a creative destruction case. To valid such an assumption, we have to test the long-term effect.

The Estimations of the model (4), has provided us with a Short-run coefficient of FDI. To validate the theoretical assumptions set in Table 1, we need to determine the effect of the long-run FDI coefficient. Taking into account that the short-term coefficient is much lower than 1, only two assumptions are expected: substitution and creative destruction. The dynamic structure of the equation (4) allows us to calculate the long-run elasticity Investment in FDI flows from the speed of convergence to the equilibrium rate of investment.

$$\omega_{lr}(FDI) = \frac{\omega_{sr}(FDI)}{1-\propto}$$

The Significance can be tested using the Wald test to conclude for the true value of the parameter.

Table 7. The Wald test

The long-run elasticity	**0,317** **(0,299)**
Wald test	**Chi2= 0,29**
H0:α_2=1	**(0,598)**
H1:$\alpha_2 \neq$1	
P -value	

The long-run elasticity of FDI displays a value of 0,317 (calculated on the base of the estimated coefficients). The first remark is that the coefficient is still smaller than one which shows that the substitution effect is still persistent. However, this value is higher than the short-run coefficient indicating that the crowding out effect of the foreign investment is decreasing. Therefore, if in the short-term there is a substitution relationship (as demonstrated by the less than one FDI coefficient) it tends to reduce in intensity in the long term, yet without turning into a complementarity between FDI and the local investments.

However, according to the Wald test we could not reject the assumption that the long-term coefficient is equal to 1 but we interpret this result very carefully since its significance is quite weak (0, 29) as well as the standard deviation which is relatively high (0,598).

We, then, infer that there is certainly a substitution effect of FDI on domestic investment. This effect is decreasing, but its long-term evolution could not lead to complementarity. The Local companies, forced to leave the market because of the competitive pressure and insufficient institutional support, are not fully replaced even after some time. The negative effect on the local investment is likely to occur in the same area, but also in the upstream sector. When we consider the downstream sectors, higher quality inputs can stimulate investment, but this effect is less important and requires more time (especially since the top quality inputs often mean higher supply cost).

It's worth mentioning that since the substitution is the result of the competitive market mechanism, the net gain at the aggregate level will be positive. On the one hand, the consumer will benefit from the better quality of the products offered by the foreign subsidiaries. On the other hand, the high productivity of FDI will accelerate the economic growth.

5. Conclusion and Recommendations

The aim of this article is to clarify the relationship between FDI and the gross fixed capital formation in seven countries of the MENA region through a panel data technique. We have concluded that the most plausible assumption for these countries is the eviction of the local investment projects following the entry of FDI.

We wonder, whether the government intervention would be necessary in this regard. The goal of the economic policies is to maximize the internal rate of investment and to avoid the negative effect of substitution.

A liberal opinion would be against a government intervention. However, the elimination of the local companies will increase unemployment. In addition, the economies of these countries would face a long-term denationalization of some sectors.

In this perspective, a selection policy on FDI might be beneficial. The preference should be in a sense that leads to a stimulation of the long-run local investment. The authorities should encourage the establishment of foreign investments in the underdeveloped sectors of the economy avoiding, thus, the areas where there is already a consistent local production.

A last recommendation seeks to encourage export-oriented FDI, provided they respect a minimum local content for their end products. The concrete modalities of the implementation of these measures are likely to fail if it pursues a too restrictive policy. The best solution would- in our opinion- be a combination of a liberal opening foreign investments policy with an incentive system to target certain types of FDI. Thus, even in the case of substitution of local enterprises, governments can use fiscal policy levers to stimulate the reinvestment of funds thus released.

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Note

Note 1. The MENA region refers to a large area, from Morocco in northwest Africa to Iran in southwest Asia, which usually includes all countries of the Middle East and North Africa.

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Impacts of Monetary Policy and Information Shock on Stock Market: Case Study in Vietnam

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Abstract

Evaluation of the impact of monetary policy on Vietnam stock market plays an important role for economists as well as stock investors. Stock price index not only gets impacts from the macroeconomic factors such as oil price, gold prices…but also be very sensitive to the changes in monetary policy. For each different markets, stock index are also different from each other. Hence, this artical is conducted to evaluate the impacts of monetary policy on Vietnam Stock Index (VNIDEX) in the period of the time from 2006 to 2015. The author uses GJR - GARCH model and ARDL research with time-serie data by statistical methods and quantitative analysis to evaluate the above impact related to lag and shocks in the market. The result shows that the monetary policy including interests, exchange rate and required reserve ratio has a negative impact on stock price in long term. Besides, both bad or good market shock cause changes of stock price at stable level.

Keywords: ARDL model, GJR-GARCH model, monetary policy, stock price

1. Introduction

1.1 Introduce the Problem

Vietnam stock market was born in 2000 in HCM city. After that, till 2005 the Stock center in Hanoi was established. Although regarded as a newbie trading center, Vietnam Stock market has experienced the up and down periods, both strong development and severe recession. From 2005-2008 the stock price reached a top point of 1137.69 points on Mar 12th 2007, and then fell sharply to 245.74 point on Feb 24th 2009. After this period, the market grows slowly with the fluctuated level around 500 points.

At present, there are tens of billions of transaction on the Stock Exchange in Vietnam daily. Profits from stocks are the main income of many young peoples or the accumulated pension of the old (Maskay, 2007). The change (degradation) of the stock market will led to the confusion in investors' lives because it directly relates to their main income. These changes are due to the impact of international market factors (Maskay, 2007) or the monetary policy (macroeconomic) of the central bank. Therefore, the study of impacts of policies, especially monetary policy is considered as an important key which helps investors to make right decisions.

There have been many studies on fluctuation of the stock price and monetary policy. The authors approved that stock indices react sensitively to changes of monetary policy (Azali, Zare, & Habibullah, 2013). Stock investors always follow market's changes in general and the monetary policy of the central bank in particular in order that they can make a right dicision which will bring benefit. Hence, studying impacts of factors on stock price become a vital part which helps investors to make investment decision.

Nowadays, in Vietnam, there are some studies on macroeconomics or the monetary policy (Ton & Nguyen, 2015), however, there is no study on the long-term or short-term impacts of financial shock and the monetary on the stock price in detail. These aims of this article is following as: firstly asscessing the short term and long term impacts of the monetary policy on the stock price; and secondly considering information shock's impact on stock index.

1.2 Theoritical Overview

Monetary policy is a monetary measures implemented by the Central Bank to make influence on economic activities, price stability, employment maximum and stability of the long-term interest rates (Okpara, 2010). In fact, many economists consider monetary policy as the most important macroeconomic policy (Maskay, 2007). Apart from the impact on inflation (within the allowed limit of the central bank to control inflation and supervise bank system), the monetary policy also affects other aspects of the economy such as real GDP, unemployment and exchange rates, the stock market.

The theory of "efficient market" by Fama (1970) has set an extremely important theoritical basis for policy makers as well as stock investors. Accordingly, the policy makers can freely implement the national macro-economic policies without fearing that this policy will change the essense of the stock market because they only affect the stock price index. Since then there have been many researchers focusing on the impact of these monetary policies on changes in the stock index.

Monetary policy can be conducted through many different tools such as exchange rate policy, interest rates, money supply or the required reserve. The policy of interest rates is attractive to researchers to assess the impact on the stock market. Studies have shown that interest has an opposite impact on the stock price (Ali, 2014; Dufour & Tessier, 2006; Okpara, 2010; Fischbacher, 2012; Zare et al., 2013; Gali & GAMBETTI, 2013). At the second rank, exchange rate policy can help investors to forrcast the market change through the exchange rate policies of central banks (Maskay, 2007; Jamil & Ulla, 2013; Adjasi et al., 2008). Some studies also examined the impact of money supply on the stock price (Homa & Jaffe, 1971; Hamburger & Chochin, 1972; Maskay, 2007; Nofeldt, 2014), it showed a positive relationship between the money supply and US stock market, typically the S & P500 Index.

Apart from three key factors, the central bank also uses some other tools in their operations as required reserve ratio for banks (Teja et al., 2013) and open market operations. However, for newbie financial markets like Vietnam, the application of the open market is not effective when the transaction is not entirely through banks. Therefore, open market operation seems not to affect to adjustment of the monetary policy as well as the stock market.

2. Method

2.1 Researching Models

In this research, the author uses the time-serie data to evaluate the immediate impacts and influctuation at lag. To solve the researh aim, the author refers the previous studies and launch research model with variables as below:

Tabel 1. Aspect and reference model

Variable name	Aspect	Authors
Interest rate	-	Ali, 2014; Dufour & Tessier, 2006; Okpara, 2010; Fischbacher, 2012; Zare & et al, 2013; Gali & Gambetti, 2013
Exchang rate	-/+	Maskay, 2007; Jamil & Ulla, 2013; Adjasi & et al, 2008
Money Supply	+	Maskay, 2007; Nofeldt, 2014
Required reserve ratio	-	Teja & et al, 2013

Source: Authors' collection.

With interest rate, exchange rate, money supply and required reserve ratio are chosen as independent variables in the below model:

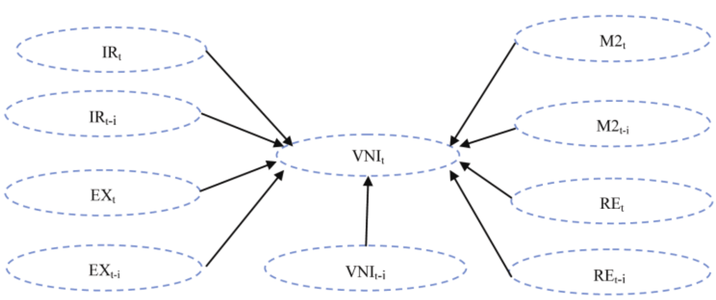

Figure 1. Researching model

In Which:

Dependent variables:

VNI is VNINDEX price at time “t”

VNI_{t-i} is VNINDEX price at lag i

Independent variables:

IR_t: lending interest rates.

EX_t: USD exchange rate.

$M2_t$: money supply.

RE_t: required reseve ratio.

The Variables IR_{t-i}; EX_{t-i}; $M2_{t-i}$ and RE_{t-i} are values at lag i.

To study the impact of these information shocks as well as monetary mutations on the stock price, the authors used the variance estimating model:

$$h_t = \gamma_0 + \delta_1 * h_{t-1} + ... + \delta_i * h_{t-i} + \gamma_1 * u_{t-1}^2 + ... + \gamma_i * u_{t-i}^2 + \nu_1 * u_{t-1}^2 * d_{t-1} + ... + \nu_i * u_{t-i}^2 * d_{t-i}$$

In Which:

h_t: variances

$d_{t:}$ variables of possitive and negative shocks.

2.2 Method of Analysing

To evaluate the impact of the monetary policy on the stock price, the time-serie data is used, so ARDL model is chosen to study.

For time-serie data, to ensure sustainable model before performing ARDL model, researcher used the data source (stable data chain). The stable input data will avoid fake regression case (Gurajati, 2003; Ramanathan, 2002).

Besides evaluation of the factors having impact on dependent variables, there is many invisible variables, espeically information shocks which needs being considered carefully to study changes of dependent variables in more detail. In economic models, Engle has developed the first ARCH models in 1982 and later he cooperated with Kroner to develop GARCH in 1995 to estimate further market shocks. Basing on the premise of estimating shocks by Engle, the scientists including Glosten, Jaganathan and Runkle (1993) has developed more by giving and estimating positive and negative shocks to consider any differences between them (called GJR-GARCH model).

In this study, in order to asscess impact of manetary policy on Vietnam stock market in 2006-2015, the author also uses ARDL model to evaluate the impact of market issues on stock price and GJR-GARCH to estimate positive and negative shocks in this research period.

$$Y_t = \alpha 0 + \alpha 1 * Y_{t-1} + \alpha 2 * Y_{t-2} + ... + \alpha n * Y_{t-1} + \beta 0 * Xi_t + \beta 1 * Xi_{t-1} + ... + \beta n * Xi_{t-n} + E_t + ut \quad (1)$$

$$h_t = \gamma_0 + \delta_1 * h_{t-1} + ... + \delta_i * h_{t-i} + \gamma_1 * u_{t-1}^2 + ... + \gamma_i * u_{t-i}^2 + \nu_1 * u_{t-1}^2 * d_{t-1} + ... + \nu_i * u_{t-i}^2 * d_{t-i} \quad (2)$$

In which: Y_t and X_t are variables without unit root; u_t is residual;

Y_{t-n} and X_{t-n} are stationary variables at lag levels.

E_t is long-term impact of stationary variables of X_t;

h_t: variances;

$d_{t:}$ variables of possitive and negative shocks.

Stationary time-serie is a series with constant mean, variance, covariance at every time (Gurajati, 2003). To test stationary of time serie data, the author uses open ADF (Gurajati, 2003).

Optimal lag is lag at which variables are modeled through the lag variables and the other variables at the same lag level. The determination of the optimal lag is based on selected indicators (Hansen, 2013); these indicators are supported in EViews software.

To ensure a sustainable model, the regression equation needs to satisfy the conditions of redundant variables test (guarantee that models do not contain redundant variables – do not influence on the stock price); heteroscedasticity, autocorrelation test.

In equation (2) if the coefficient has statistically significant, positive and negative shocks will have different impacts on the variance h_t (Ton & Nguyen, 2015).

3. Results

3.1 Some Figures on the Monetary Policy and Stock Prices

The input data description Statistics: In the period 2006-2015 the stock index reached 543.28 points at average; in which the maximum value reached 1137.69 points, the lowest value was 245.74 points. Credit interest rates was 12% per year at average, there was a period up to 20.25% per year in 7/2008. Dollar exchange rate fluctuates around 18,789 VND/USD; consumer price index reached 107.67 at average; the money supply M2 monthly reached 2,510,000 Bil VND at average and required reserve ratio was 4.16% in the periods (Table 2).

Table 2. The period 2006-2015

	VNI (poit)	IR (%)	EX (VNĐ/USD)	CPI (poit)	M2 (VND)	RE (%)
Mean	543.28	12.00	18789.41	107.67	2.51E+15	4.16
Maximum	1137.69	20.25	21673	145.10	5.34E+15	11
Minimum	245.74	7.23	15914	62.48	6.76E+14	3
Observations	117					

Source: The authors' collection.

3.2 Correlation Matrix

Correlation coefficients evaluate the two-way relationship of each pair of variables. To examine the relationships as well as performance of the following analysis, the authors used the values of Loganepe which helps data series be more stable but still does not alter the transitivity characteristics between variables. Results show that the variable dependent in stock price has the strongest correlation with money supply (0.5641) and interest rate (-0.5614), weakest correlation with the required reserve rate (-0.3420) (Table 3).

To evaluate research objectives more clearly, the authors performed a regression analysis based on GJR-GARCH and ARDL model.

Table 3. Correlation matrix

	LVNI	IR	LEX	LM2	RE
LVNI	1				
IR	-0.5614	1			
LEX	0.3747	-0.2791	1		
LM2	0.5641	-0.5631	0.9276	1	
RE	-0.3420	0.4565	-0.7015	-0.6741	1

Source: Eviews' results.

3.3 Unit Root Test

To assess the impact of monetary policy on stock prices, the input variables must be ensured with data reliability in order to avoid the fake regression, data needs to be stationary (Gujarati, 2003). The test results were obtained as follows:

Table 4. Testing result for unit roots of data series

Variables' name	Test result ADF	Statistical Value at the levels of significance.			Prob
		1%	5%	10%	
LVNI	-2.387	-3.489	-2.887	-2.580	0.148
IR	-2.680	-3.490	-2.887	-2.581	0.081
LEX	-0.515	-3.489	-2.887	-2.580	0.883
LM2	-2.373	-3.489	-2.887	-2.580	0.152
RE	-3.388	-4.067	-3.462	-3.157	0.060

THE FIRST DIFFERENCE					
DLVNI	-8.254	-4.041	-3.450	-3.150	0.000
DIR	-6.965	-4.041	-3.450	-3.150	0.000
DLEX	-8.565	-4.041	-3.450	-3.150	0.000
DLM2	-9.299	-4.041	-3.450	-3.150	0.000
DRE	-4.397	-4.070	-3.464	-3.158	0.004

Source: Results from Eviwes software.

Results showed that the variables do not stop at the significant level of 1%, 5% and 10% so, the author uses the 1st difference and re-tests then finds out that 1st difference variables are satisfied for conditions of stationary. Therefore; variables are put into the regression analysis at the first difference in the following steps.

3.4 Determining the Optimal Lag

In the economic study with time-serie data, factors not only have an immediate impact but also influence at lag stages. To determine the optimal lag and to underestimate the influence of monetary policy on stock price correctly, authors used statistical indicators to determine appropriate lag level. Results from the data analysis in the period 2006-2015 are shown as follows (Table 5):

Table 5. The result for determining optimal lag

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	96.27573	NA*	0.007703	-2.02835	-1.889471*	-1.97235
1	97.98739	3.195099	0.007583*	-2.044164*	-1.87751	-1.976959*
2	98.23699	0.460385	0.007711	-2.02749	-1.833059	-1.94908
3	98.58347	0.631352	0.007825	-2.01297	-1.790761	-1.92336
4	98.90625	0.581014	0.007946	-1.99792	-1.747936	-1.89711
5	99.36337	0.812646	0.008044	-1.98585	-1.708096	-1.87385
6	100.588	2.149956	0.008007	-1.99085	-1.685313	-1.86764
7	100.6321	0.076398	0.008181	-1.9696	-1.636294	-1.83519
8	100.6887	0.09681	0.008358	-1.94864	-1.587554	-1.80303

Source: Results from Eview software.

Results showed that the study data sources affect each other in two stages (the impact of monetary policy on stock index immediately in that month and after one month). Thus, the authors choose lag level of 1 to establish a research model.

3.5 Testing Cointegration

To determine the long-term relationsip between the monetary policy and the stock price, the author implemented testing for stationary variables.

Table 6. Testing cointegration

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**Prob.****
None *	0.560	149.452	0.000
At most 1 *	0.342	76.300	0.000
At most 2 *	0.283	39.111	0.003
At most 3	0.089	9.558	0.316
At most 4	0.014	1.292	0.256

Source: Eview's result.

The results showed there are two long-term relationships between monetary policy and stock price. Therefore, by using the regressions ARDL, the author evaluates which is the long-term relationship in detail.

3.6 Regression Results

Since the study objective is assessing the one-way impact of monetary policy on the stock price so, the author focuses on regression analysis without considering the cause and effect of the relationship between variables (Granger test). Firstly the authors will give a research model of the factors that impact on the stock price, then will estimate the influence of the shock market. Final results were obtained as belows:

Table 7. Results of estimating factors' impact on stock price

	DLVNI		
	β	**S.E**	**Prob**
C	1.585216	0.8692	0.0682
LEX(-1)	-0.14968	0.0864	0.0832
IR(-1)	-0.00339	0.0018	0.0541
RE(-1)	-0.01728	0.0041	0.0000
R^2		12.50%	
Prob(F-s)		0.000	
Heteroscedasticity test		0.6762	
Autocorrelation test		p-value>0.1	
	LEX(-1)		1.977
Multicollinearity test (VIF)	IR(-1)		1.268
	RE(-1)		2.303

Source: EVIEW system.

To make sure the reability of the estimating model, the authors tested the breach of the hypothesis of regression estimates. The results showed that the model (1) does not meet Heteroscedasticity, Autocorrelation and Multicollinearity (Table 7). It shows credibility of the conclusions from the estimating model.

Results showed that monetary policy has the opposite effect on Vietnam stock price through three policy instruments: interest rates, money supply and required reserve ratio (p-value is less than 0.05). However, the effects will have long-term impacts, but in the short-term, monetary policy seems to have no meaning in making the stock price change.

To explore the impact of information shocks, authors conducted variance estimates and obtained the following results:

Table 8. Results for market shock estimats

	h_t		
	β	**S.E**	**Prob**
C	0.000	0.000	0.077
u_{t-1}^2	0.163	0.103	0.112
$u_{t-1}^2 * d_{t-1}$	-0.231	0.107	0.031
h_{t-1}	0.811	0.106	0.000

Source: Eview's results.

The shock is estimated by the residual value and the variance is in the previous period 1 unit. The variance (h_{t-1}) at lag 1 has statistical significance (p-value is less than 0.05) indicates influence the information to the stock market. Also, the p-value of the equilibrium coefficient of positive or negative shocks ($u_{t-1}^2 * d_{t-1}$) by 0.03 (less than 0.05) and negative beta coefficient indicates the bad information elements will have less affect than good information (Glosten, Jaganathan, & Runkle, 1993).

4. Discussion

Stock price index of Vietnam from 2006 till now has strong change periods (stock bubble), which helped pushing stock prices higher (1137 points) but then the stock price plummeted due to economic crisis in the mid of 2008. It can be said the period of 2006 to 2007 was the beginning of the Vietnam stock market as well the golden period. However, mainly because of the development by leaps and bounds in a short time, the shortage of preparation for the change of the market as well as the integration process, it made investors not react to the economic crisis of 2008 in time, and made market plunge to below 300 points (Figure 2).

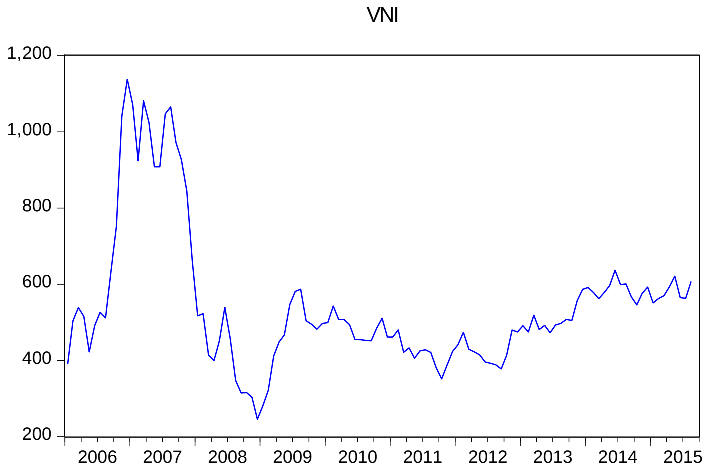

Figure 2. Stock price over the year

Research results show that the monetary policies (interest rate, exchange rate and required reserve ratio) have long-term impacts on the stock price. At the same time, the monetary policy limits stock price (opposittte impact on the stock price). The factor of Money supply seems to be no meaning in changing stock market.

Interest rates have the opposite effect on the stock price. It shows that tightening the monetary (increasing interest rates) would make the stock market decrease. In the case of high inflation, state banks have tightened the monetary policy by raising interest rates, which in the short term will not affect the stock market, but in the long term it will have negative affect to businesses, especially companies that use large amounts of bank loans for their business operations. The research results of interest rate is compatible with previous studies of (Ali, 2014; Dufour & Tessier, 2006; Okpara, 2010; Fischbacher, 2012; Zare et al., 2013; Gali & GAMBETTI, 2013).

The policy of required reserve ratio also has the opposite effect on the stock price. Increasing the ratio of required reserve in banks limited the amount exchanged between banks and outside individuals, business. In the short time, companies can invest or make liquidity by external borrowings. However, in the longer term, increasing required reserve ratio will causes many difficulties for enterprises' business activities.

The exchange rate VND/USD has a negative impact on the stock price. It shows that adjusting exchange rate or currency devaluating will make stock market get worse.the reason comes from an increase in import price making difficulties for enterprises. It causes business activities in the country get worse and stock price decrease.

Information Shock has affected stock market prices, the good news shock has more powerful than the bad news. This suggests that investors always appreciate good information shock. When there is good information flows from market, it will fluctuate stock price (stock price increase). But, if receiving the bad information flow, prices fluctuate with smaller amplitude.

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Competitiveness Determinants of Moroccan Exports: Quantity-Based Analysis

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Abstract

The term competitiveness is a relative concept whose perception changes with the level of conducted analysis (nation, sector, company). Thus, a variety of internal and external factors can have deep effects on the competitiveness of a given entity. This paper aims to evaluate the competitiveness of Moroccan exports by identifying the main determinants that explain their performance. This is particularly dealing with the impact of customs' tariff, the tariff of import, foreign demand, the share of the non-residents in the capital of domestic enterprises and the investment rate compared to the value of exporters.

Moreover, this paper presents a literature review on competitiveness and examines the main results of our econometric analysis regarding the determinants of export competitiveness applied to the top ten branches most exporters in Morocco. The gained results allow confirming the sensitivity of exports by branch to the situation of Morocco's main trading partner namely the European Union while emphasizing, quantitatively, on the role played by the investment effort undertaken by Moroccan exporting companies in improving the competitiveness of national exports.

Keywords: international competitiveness, trade, foreign exchange

1. Introduction

Following the signature of the Association Agreement with the European Union (AAEU) for the membership to the GATT agreements in 1987 and Uruguay Round (1984-1994), it is clear that Moroccan companies will face a highly increased competition. This situation will reduce the market shares already acquired and limit the possibilities of becoming competitive in the foreign market if the Moroccan economy does not improve its competitiveness. In this case, the capacity of Moroccan enterprises requires to better manage its resources, seeking the best investment and the development of their capacity of innovation that will be put to the test. These factors have a significance effect in improving the absorption capacity of the new technologies developed by competitors.

In order to evaluate the competitiveness of the Moroccan economy, this paper attempts to study the competitiveness of the most exporting industries in Morocco over the 1998-2014 period and to check whether the exporting companies in Morocco are sufficiently qualified to deal with a competition already looking fierce. This will, initially, be providing theoretical insight into the determinants of international competitiveness. Secondly, we propose a model of the determinants of structural competitiveness of the export industries. The final part will be devoted to an econometric analysis which identifies the factors likely to influence the international competitiveness of the Moroccan productive structure.

2. Literature Review

2.1 Definition and Concept

For a long time, the economic theory was interested in the exchange's economic determinants. In the exchange's traditional theory, the study of international exchange is based on different comparative advantages: a country exports a good which it holds a comparative advantage.

The concept of international competitiveness is frequently used as part of the analysis of macroeconomic performance of a given country. It compares, in fact, for a country and its trading partners, certain characteristic factors of the economy that provide elements of analysis on the development of international trade. This concept comprises primarily qualitative or not easily quantifiable factors.

The examination of the literature on the concept of competitiveness reveals the lack of a single and unique definition of the term competitiveness. Used in many empirical studies, the concept of competitiveness has not yet reached the accuracy level that is to expect “in economics” (Nezeys, l993). It appears that the competitiveness varies with the level of the analysis (nation, sector, company), analyzed property (homogeneous or differentiated), and the objective of the analysis. Several authors emphasize that economic theory sets no static definition of competitiveness (Sharples, 1990; Ahearn et al., 1990). Definition of competitiveness probably due gain precision from a theoretical point of view as empirical. To clarify this point more, a myriad of quotations from economic literature is presented below.

Competitiveness is the ability to provide goods and services in time, at place and in form required by foreign buyers at price equal to or better than that of other potential suppliers while earning at least the opportunity cost of the resources that are used (Sharples & Milham, 1990). According to Tyson (1992), competitiveness is the ability of a country to produce goods and services that meet the conditions of international competition, while allowing its citizens to enjoy both a growing and sustainable standard of living. The Organization for Economic Cooperation and Development (OECD) uses the following definition: the ability of companies, industries, regions, nations and supranational assemblies to generate, while being exposed to international competition, income levels and employment of factors relatively high (Hatzichronologou, 1996). The European Commission defines competitiveness as a steady increase in living standards in a country or region and a level of involuntary unemployment as low as possible. Indeed, for most economists, the competitiveness of the nation is a relevant concept that measured the ability of a country to achieve its economic growth target by getting involved in the international business. Consequently, the competitiveness can be defined as the ability to compete and compete successfully. An economy would be competitive if it is able to sell products that meet the requirements of the foreign demand (in terms of price, quality and quantity), while generating profits with which to develop. Given the multiple meanings associated with the term “competitiveness”, we have to, from the beginning, locate the definition that we have retained in the economic literature. For this purpose, we use the following definition: Competitiveness is the production ability of a unit (company, national industry, etc.) to monopolize, profitably and sustainably, a large market share (Hazledine, 1993). This definition will serve as a starting point to establish a method execution for detailed quantitative analysis of competitiveness and its main determinants.

In Spite of this diversity of definitions, it should be noted the following two common aspects: (i) competitiveness is a relative concept, ie, the assessment of the competitiveness of a nation or a sector is usually made with respect to a similar entity; and (ii) competitiveness is not a static concept and is closely linked to the economic conditions of the country as well as international market conditions. So to endure competitive, an entity is required to follow a continuous process of adjustment in response to forces and of the factors in determining its competitive position on the market.

In general, a good measure of competitiveness should meet at least three essential criteria: First, cover all sectors that are exposed to competition, namely only traded or tradable goods; secondly, to include all markets where competition exists; and thirdly, be made from absolutely comparable international data. In practice, the available indicators generally have imperfections in these three criteria.

The neoclassical analysis incorporates the basic assumptions of the Ricardian model. But unlike Ricardo, its protagonists (Chakroun, 2002) explain that countries have access, worldwide, to the same types of production factors, substitutable for each other and to the same technologies. In this perspective, the technical change can only be conceived as a movement along the production functions in response to changes in relative prices: innovation is just a simple adaptation to the relative prices of factors of production that aim to reduce the costs.

Nowadays, the great upheavals of the economic system, globalization of production, research and development markets have resulted, in the 1980s, the proliferation of inter-company cooperation agreements and intensification of the internationalization phenomenon of firms. They therefore renewed discussions about the ability of developing countries to make better use of the technology boom of the industrialized countries, and to develop competitive advantages in the global market.

To sum up, even if unanimity is not required on the concept of competitiveness, it is generally perceived as the ability of countries to successfully integrate into the global economy. By measuring competitiveness, even in a well-defined conceptual framework is the result of many compromises in the choice of criteria and objectives, taking into account all available data. In addition, many technical considerations must be taken into account in the construction of competitiveness indicators for which there is no single solution, even in theory.

2.2 Competitiveness Measurement

The international competitiveness of a country is measured by its results or its factors. In the first case, analysts use market share indicators and in the second case the indicators of cost and price.

The cost indicators compare the export cost indices of a country to its competitors or those of its partners. The relative stability in the cost of labor compared to other production costs make the indicator of the relative unit cost of labor (C_m), shown below, the most used indicator.

$$C_m = (e\ w\ l/Q)\ /\ (w^*\ l^*/Q^*) = e\ (w/w^*)\ (q^*/q) \tag{1}$$

With $q = Q\ /\ l$: the apparent labor productivity; l: defined as level of employment; w: wage rate; e: nominal exchange rates, and we noted by " * " the exogenous variables. A decrease of C_m or other cost indicator represents an improvement of the external competitive position of the studied economy. This decrease reflects increased costs outside compared to internal costs.

The market share indicators measure the level of exports at constant prices for a country i over a period: $Pm_{it} = \overline{P}\ (Q_t - Q_{t-j})$; or it measure the level of its exports compared to a reference zone R: $Pm_{iR} = (P_iQ_i) / (P_iQ_i + P_RQ_R)$. An increase in Pm_{iR} or Pm_{it} is interpreted as an improvement in external competitiveness. This increase reflects an increase in market share of country i compared to the reference zone or in the period of study.

Market share or more accurately the growth of the market share has been used as a performance indicator in many empirical studies (Larson & Rask, 1992). However, contrary to the measures relating to production costs and those that are related to the productivity of factors, this indicator captures both the factors of non-price competitiveness than price competitiveness factors affecting the performance of a given product. Therefore, it is considered as a measure of the outcome of competitiveness. Moreover, despite its widespread use, this indicator can be insufficient. Indeed, this indicator cannot distinguish between an increase in market share due to improvement of performance of that due to an export subsidy, or between a decrease in the share due to poor performance from that due to a quota.

2.3 Determinants of International Competitiveness

Becoming internationally competitive is considered an objective of public policy. The primary objectives of international competitiveness can explain many steps taken by governments: the reduction of the deficit, reduction customs barriers and the reductions of social safety net.

For economists, the concept of international competitiveness must be purged of its mercantilist origins and associated to concepts of increasing productivity and living standards. Among the factors that affect competitiveness and consequently export performance, several authors have specifically investigated the role played by the following factors:

- The productivity: improvements made in terms of organization of labor, changes in the quality of production factors, a better knowledge of production processes and the efficiency of resource allocation can positively affect the productivity. In this context, productivity gains appear to be a critical determinant of the competitiveness of a given country (Parienty, 2013).

- Customs tariffs: A Customs Tariff duty is the simplest of trade policy measures. It is a tax levied on the occasion of the import of goods. This variable are traditionally used as a source of income for governments but their true purpose is none other than protecting particular economic sectors. From the perspective of the exporter, the augmentation of the customs duties can be considered like a transportation cost. Thus, the tariff increases the price of goods in the importing country and the decreases in the exporting country. Consequently, consumers are subject to losses in the importing country and gain in the exporting country. As for producers, they share gains in importing countries and losses in the exporting countries.

- Exchange rate: Macroeconomic theory considers a decline in the real exchange rate (a fall in the relative price of tradables in terms of nontradables goods) boost exports and limit the effect of external constraints. From this angle, the devaluation is a powerful factor that can promote the development and international competitiveness (Boltho, 1998).

- Global demand: To fully benefit from opportunities offered by trade liberalization, it has been shown that a country have interest to choose wisely its foreign partners. However, given the size of the market and product quality required for export, developing countries will gain more if they trade with industrial countries than trading with poor countries. The effort of developing countries to valorize their exports and thus ameliorate their competitiveness, allows them to access to the market of developed countries. Thus, at every increases of global demand, especially in developed countries, increases the export, in developing countries, of products which seem competitive with those in rich countries.

- Foreign participation: the share of foreign capital in the Moroccan companies is considered a significant source of funding in addition to its role in transfer of technology and know-how. The investment effort constitute a determining factor in the creation of dynamic comparative advantage, capturing economies of scale and increasing returns (Mzoughi, 2000). The investment also helps to stimulate technological innovation and improve the productivity of factors. For this purpose, it is a key determinant of competitiveness and the long-term growth of an economy. The accumulation of capital then offers companies the possibility to fully take profit from the opportunities in the global market, caused by additional global demand or a favorable diversion of international conditions. In this perspective, we can consider that high competitiveness is a dynamic sustainably and sustained accumulation of capital (Toujas-Bernate, 1991). Its insufficiency denotes an inability of domestic producers to meet domestic and foreign demand. It results, in addition, in a relative loss of export market shares and in a systematic deterioration of external position (Chakroun, 2002).

3. Methodology

3.1 Data

Examining the evolution of the performance of all branches is obviously tricky. This paper will focus on the competitiveness of the Moroccan economy internationally by analyzing the evolution of the turnover of national exportation. The unavailability of sufficient data to carry out this study by product has thwarted us to be limited to an aggregate level by branch. We will try to conduct the study with a sample of the most export sectors, covering a significant part of the turnover of Moroccan exportation.

We will calculate the export share of each branch in the total exports belonging to the period of study. We note that throughout the period of our study, the first ten branches covering almost 75% of total Moroccan exports, therefore we will include in our sample any branch occupying in a year of the study period rank among the top ten branches most exporters. Therefore, we get the sample composed by order the following branches:

D24 branch (Note 1): Chemical Industry (Note 2);

D31 branch: Manufacturing machines and Power Devices;

D34 branch: Automotive Industry;

D18 branch: Industry of Clothing and Furs;

D23 branch: Refining of Petroleum and Other Energy Products;

D15 branch: Food Industry;

D17 branch: Textile Industry;

C01 branch: Extraction of Coal, Lignite, Peat;

A00 branch: Agriculture, Forestry, Hunting;

D27 branch: Metallurgy.

3.2 Model

Analysis Recent economic literature on the determinants of export uses the following specific econometric model:

$$EXPO = \alpha_0 + \alpha_1\, ER + \alpha_2\, Tariff + \alpha_3\, GD + \alpha_4\, FORE + \alpha_5\, Inv + \mu \quad (2)$$

We have:

- *EXPO*: Export;

- *ER*: Exchange Rate of exporting country;

- *Tariff*: Customs Tariff of the foreign country where the exported product is intended;

- *GD*: Global demand of the foreign countries in products, in other words: their imports;

- *FORE*: share of non-residents in the capital of domestic enterprises;

- *Inv*: investment rate (investment ratio, added value);

- μ: Error term.

The study covers the period between 1998-2014. In the case of Moroccan exports, the empirical analysis of the competitiveness of the Moroccan economy will be based on the following variables:

- EXPO: Moroccan exports by industries; source: Exchange Office;

- ER: Exchange Rate of Morocco represented by the weighted average of the currencies of major trading partners. The weighting system is the share of these countries in foreign trade of the country. The selected partners are the EU, the USA, Japan, England, Canada…

- Tariff: European Union tariffs. Source of tariffs is the World Bank.

- GD-EU: Imports of the main trading partner of Morocco (MAD value), namely the European Union, because foreign trade with the European Union alone constitute more than 66 percent of foreign trade of Morocco (Ministry of Plan, 2012). Data collected from the World Bank. These were collected in Million Dollar then were transformed into Dirham based on the rate ($ / MAD) of the Exchange Office;

- FORE: Foreign participation in the capital of Moroccan manufacturing firms (in %), by branch; Data collected from the Ministry of Industry, Trade, Investment and the Digital Economy;

- Inv: the rate of investment by branch, it is calculated as a ratio: investment relative to the added value.

4. Results

The results of our calculations (following table) are not always in line with expectations of theoretical development. In this model, the variables shown above are expressed in logarithmic form so that their coefficients can be readily interpreted as elasticities.

Table 1. Determinants of competitiveness of the Moroccan economy

Branch	log(ER)	log(Tariff)	log(GD-UE)	log(FORE)	log(Inv)	R^2	DW
Branch D24	0.35	0.46	0.72		0.14	1	1.67
	(0.031)	(0.020)	(0.035)		(0.079)		
Branch D31	2.56	0.47	0.43	-0.32	0.91	1	1.80
	(0.048)	(0.017)	(0.071)	(0.062)	(0.029)		
Branch D34		-2.17	0.46	2.12	0.42	0.60	1.30
		(0.001)	(0.089)	(0.023)	(0.018)		
Branch D18	0.40	-1.47	0.62	0.08	-0.37	1	1.10
	(0.023)	(0.028)	(0.032)	(0.047)	(0.010)		
Branch D23		-7.52		1.39	0.91**	0.90	2.50
		(0.079)		(0.035)	(0.037)		
Branch D15		-0.78	0.97		0.24	0.92	3.40
		(0.049)	(0.021)		(0.085)		
Branch D17	0.24	-1.68	0.23	0.62	0.37	0.82	1.42
	(0.063)	(0.017)	(0.013)	(0.044)	(0.059)		
Branch C01		-3.79		1.13	0.67**	0.79	2.90
		(0.035)		(0.038)	(0.022)		
Branch A00		-2.56	0.74			0.95	1.37
		(0.043)	(0.040)				
D27	0.36	-0.51	0.39	-0.32	0.54	1	1.13
	(0.078)	(0.050)	(0.091)	(0.061)	(0.024)		

Source. Authors' calculations.

The results of the econometric estimation are consistent with economic theory, to the exclusion of tariff elasticity (in the case of Chemical Industry), of foreign participation in the capital of Moroccan enterprises (in the case of Chemical Industry, Machinery Manufacturing industry and Electrical Devices and Metallurgy) and of the investment rate (in the case of Industry of clothing and Furs).

The long-term effect of economic openness of the European Union, measured in this paper by tariffs, should have a positive effect on the competitiveness of Moroccan exporting entities. This hypothesis are confirmed in most branches. Therefore, for any relief European customs barrier of 10%, follows an increase in exports of 75.2% (resp. 1.6%, 4.7%, 21.7%, 14.7%, 7.8%, 16.8 % 37.9% 25.6% and 5.1%) for the Refining Oil and Other energy Products branch (resp. Chemical Industry branch, Machinery Manufacture Electric Appliances branch, Automotive Industry branch clothing and Furs branch Food Industry, Textile Industry branch, branch of Extraction of coal, Lignite, Peat, branch Agriculture, Forestry, Hunting and Metallurgy branch). As for the sector of the chemical industry, it reacts negatively to any lowering of European Union tariffs: any decrease it by 10% leads to a decrease in exports of this branch of the order of 4.6%.

Furthermore, the European Union is the main trade partner of Morocco. Its share in Moroccan exports represents 60% to 70% (Ministry of Plan, 2012). This leaves exports sensitive to changes in demand for the Union in Moroccan products. For every 10% increase in demand for the European Union increases the volume of exports of around 9.7% (resp. 7.2%, 4.3%, 4.6%, 6.2%, 2.3%, 7.4% and 3.9%) for the Food Industry branch (resp. Chemical Industry branch, branch of Machinery Manufacture Electric devices, branch of Automotive Industry branch of clothing and Furs, Textile Industry branch, Agriculture branch, Forestry, Hunting and Metallurgy branch).

The effort utilized by the branches of the Moroccan economy in investment seems decisive in strengthening the ability of exporters to compete and to win significant shares of the market share. So an increase of 10% of the investment effort in the long run leads to an increase in export volume of 1.4% for the Chemical Industry Branch, 9.1% for the Branch of Manufacturing Machinery, Electric Appliances, 4.2% for the automotive industry, 2.4% for the Food industry sector, 9.1% for the Refining Division of Oil and Other Products of energy, 6.7% for the branch of Mining coal, Lignite, Peat and 5.7% for the Metallurgy branch. This reflects the importance of the self-financing capacity of domestic enterprises in the consolidation of the autonomy and independence of the foreign trade (M.Chakroun, 2002). It also demonstrates that optimum utilization of production capacity is likely to meet the world demand and to take full advantage of developments in the international situation.

In the contrary, for the rest of the branches, the negative effect of an increase in the investment effort, can assume a significant improvement in the added value in these branches, followed by an improvement in exports. The flow of foreign capital also participates significantly in the international competitiveness of the Moroccan economy. The coefficient associated therewith is high in the branch of the automotive industry: a 10% increase in net flows of foreign direct investment leads to a net increase of 21.2% of the volume of its exports, while it only leads to an increase of 0.8% of exports of the branch of the clothing industry and Furs.

For other branches, namely, branch of Manufacturing Machinery & Electric Equipment Branch and Metallurgy, the elasticity of exports with respect to foreign participation is negative. Any increase in 10% of the Moroccan exchange rate, equivalent to a devaluation of the Dirham, leads to an improvement in exports of 25.6% (resp. 3.5%, 4.0%, 2.4% and 3.6%) among the branches of Machinery Manufacturing & Electric devices (resp. Chemical Industry, Industry Branch of clothing and Furs, Branch of Textile Industry and branch of Metallurgy).

The non-significance of variables denoting foreign participation to explain the value of exports of the chemicals branch & parachemistry can be attributed to the fact that the bulk of foreign trade is handled by the OCP Group (foreign participation may explain the evolution of exports since the OCP is owned entirely by the state).

5. Conclusion

This paper, through a simplified model of export performance of top ten export sectors of the Moroccan economy, led to distinguish between several effects: firstly the effect of the European demand for domestic goods and customs tariffs and the effect of increased foreign participation in the capital of Moroccan companies. It is also clear from our analysis that the impact of the improvement in the investment rate on the performance of export sectors.

The econometric results on Moroccan manufacturing branches, widely exposed to international competition, used to highlight the sensitivity of exports of these branches to the economic situation of the trading partner of Morocco namely the European Union, and its significant impact outdoor performances. The creation of the Euro Mediterranean Zone can be a salutary solution, but its success requires a substantial European Union aid and major foreign direct investment (FDI) inflows to bridge the gap between the two shores of the Mediterranean. To take full profit of these inflows, Morocco should conduct a policy in terms of training and educating its people so that the technology diffusion can fully fulfill its role in improving the productivity via the FDI. This policy should go in a new conception of international competitiveness of the Moroccan economy in general, and particularly in manufacturing sector for a long-term perspective. For this reason, the state must encourage the private investment and scientific research within the framework of mutual cooperation between the two poles university-industry, which would strengthen the competitiveness of industrial products in the international market (Chakroun, 2002, p. 14) in the long term.

It will require all stakeholders in the economic and political scene accelerate the pace of change that must be completed before the end of the transition period, otherwise it will be too late for many of the Moroccan companies that will, perhaps, put the key under the door. Other questions can be raised further:

- What currency policy should be actually implemented by the Moroccan government to advance the competitiveness of the manufacturing sector?

- The reforms and the different policies to renew and modernize the Moroccan productive structure, have they had the expected results?

- Etc…

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Notes

Note 1. Code of branch in Nomenclature National Accounting (NNA).

Note 2. Label of the branch NNA.

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Do External and Internal Crises Affect Foreign Portfolio Inflows? The Case of China and India

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Abstract

This study examines the relationship between external and internal crisis (EIC) and Foreign Portfolio Investment (FPI) net inflows in China and India. We have applied Binary Choice Model taking the EIC as a dummy variable. GDP growth is an independent variable in our model that indicates the combined performance of economic sectors. The results suggest that EIC exert a significant impact on the FPI net inflows, but the nature of internal issues is different for both countries. We find a little association between GDP growth and net FPI inflows.

Keywords: China, economy, financial crisis, FPI, GDP, India

1. Introduction

Globalization and increasing financial integration have stimulated capital flows round the globe. Some well-known benefits of having integrated markets are: diversification of risk, exploration of new markets, exchange of information, and relatively high earning expectations among investors of various regions and markets. Capital flows eventually decrease a corporation's cost of capital and contribute to the economic growth. The benefits of long and short term capital flows are obvious, but the volatile nature of these flows gives credence to the notion that these flows are pro-crisis. The global financial crisis (GFC) of 2008 was the most challenging financial turmoil for both developed and developing countries.

Subprime crisis in the USA triggered this global financial crisis. The USA Government and Federal Reserve launched bailout packages of trillions of dollars that halted the contagion effect of turmoil for a short time period, but neither addressed nor solved the underlying causes of financial turbulence (Singhania & Anchalia, 2013). In addition, the failure of Lehman Brothers, a major finance company, burst the credit bubble. Unavailability of credit and Liquidity crisis caused major slowdown to economic activities, and this set off a chain reaction from advanced to underdeveloped markets.

Economic activities of various sectors were affected at large scale during the aforementioned global financial crisis. Initial perception about the largest economies of emerging markets like Brazil, Russia, India and China (BRIC) was that they might escape from the worst effects of the crisis, but by the end of 2008, even Asian tycoons like India and China experienced a downturn in economic activities of different sectors and a slowdown of international capital flows as compared to the pre-crisis period (Enderwick, 2009). Among the BRIC nations, China and India are the most prominent recipient of foreign portfolio flows Garg and Dua (2014) discussed that during pre-crisis period Brazil, India and China are the recipient of 70 percent of total equity portfolio investment to all developing countries. Furthermore, massive reversal of portfolio flows during crisis resulted in deterioration of balance of payment. In addition, Indian economy faced the sharpest reversal in portfolio flows during recent subprime crisis.

Shamiri and Isa (2010) stated that FPI increased before the Asian financial crisis of 1997 and accounted for 40 per cent of the total capital flows in Asia. During the Asian financial crisis, a reversal occurred and sudden stops of capital flow paralyzed economy of most Asian countries. This financial crisis turned inflows into outflows; the reversal of short term capital flows was so severe that total outflows of short term portfolio reached 92 billion USD in 1998. Since last two decades, capital flows in Asia from the international markets gained momentum. This international intervention changed composition of capital flows and FPI and FDI have replaced direct bank lending.

In Asia, buoyant markets of India and China are attractive for foreign investors because of growth rates in comparison with other emerging economies. Though these markets are attractive, but at the same time vulnerable of economic turmoil. Motivated by large short term capital flows in both countries since last decade, our objective is to study ups and downs in short term net FPI inflows during crisis. Further, elaborate the impact of recent global financial turmoil and internal crisis on FPI with the help of Binary Choice model. In this study, internal crises refer to the internal issues which include policy changes, appreciation or depreciation of currency to control the inflationary effects and internal security and social issues. Whereas, external crisis indicate the major events leading to decisive social, economic or political changes in particular regional or round the globe. For our study period, the Asian financial crisis of 1997 and the Global financial crisis of 2008 are the dominant external crises.

The numerical data for crises is unavailable because measurement of crisis is not possible. To deal with this issue, we used external and internal crisis as dummy variable and data is in binary form. The presence of internal issue or external turmoil is denoted by 1 while, zero is in case of absence. To achieve this aim of understanding, the impact of financial crisis on FPI in Indian and Chinese economy, this paper is structured around seven main sections. After introduction, the following section discusses the existing literature on the impact of crises, especially about the emerging markets of Asia. The third section describes the history of major events during the last two decades in India and China. The fourth section explains FPI inflows' trend and major disparities, while the fifth section elaborates data and methodology. Section six consists of analysis and discussion, and the last section offers conclusion and recommendations.

2. Literature Review

The existing studies unanimously conclude that a financial turmoil stimulates the reallocations of both short and long term capital in various regions. The global financial crisis of 2008 was no exception and there were large reallocations of fund across regions and countries. Investors pulled out their funds from undergoing crisis countries and invest more in the relatively well performing portfolio during the recent crisis. The crisis affected certain equity markets and propagated to the European markets; because of propagations investors, particularly large institutions began to sell their equities which negatively influenced the value of portfolio of other participants. This simulation also negatively influenced the liquidity of European markets during the financial bubble. The literature also shows that the international investors adjust their portfolios during the crisis; investors from various countries adjust their funds at different degree for one destination and adjustments in the portfolio are considerable during the crisis. Reallocation of funds from international investors resulted in outflow and reversal of various types of capital flow.

Various components of capital flows pose a different degree of reversal. Capital flows are pro-cyclical, both inflows and outflows increase in expansion time and decrease during economic downfall. The dynamic pattern of capital flows is stronger than the past during the recent years. Gross capital flows are large and volatile in terms of size and volatility of net capital flows. During the crisis, gross capital flow collapse and retrenchments occur in every type of capital flow, but the effect is stronger during global financial crisis. Outflows of capital among various economies created waves of capital flow and there is a little association between capital controls and probability of surges and stops of foreign capital flows. Global factors, especially global risk, are significantly associated with extreme capital episodes. Contagion through trade, banking and geographical volatility is also associated with stops and retrenchment episodes (Sula & Willett, 2009; Forbes & Warnock, 2012; Raddatz & Schmukler, 2012; Prorokowski, 2013; Galstyan & Lane, 2013; Broner et al., 2013).

Behind all surges, stops and retrenchments, advanced countries play an important role in the crisis period. The economic slowdown of the developed nations causes economic turmoil in developing countries, because financial markets of underdeveloped countries show contagion response against the shocks transmitted from the developed markets. The economic prospects of G3 countries affected the movement of portfolio investment flows in the developing Asian countries and the recent financial turmoil caused a significant pullback of short-term capital flows. Portfolio investment and bank loans are more prone to crisis than direct investment, but financial fundamentals and institutions of Asian countries help to manage adverse effects.

It is a proven fact that advanced markets influence emerging markets. For less risk and relatively high profits, investors need to observe the financial shocks originated in the investing countries. It is necessary for international investors to pay attention to the US market volatility in order to earn profits from the Asian-Pacific markets. Due to large portfolio holdings of the US investors, these markets are vulnerable to shocks transmitted from source countries. Contrary to this, small markets can also cause volatility spillovers to advanced markets.

Uncertainty in stock market of China might have had a significant effect on G5 countries and, because of irrational behavior of Chinese investors during the crisis; Chinese market entered a speculative bubble (Jongwanich, 2010; Shamiri & Isa, 2010; Nishimura & Men, 2010).

Although advanced markets are influential on developing and shocks from them are important for investors, but literature is evident that crisis disturbed the flow of capital in both markets. Advanced nations cannot isolate themselves from the consequences of a crisis. Central and Eastern European (CEE) equity market co-movements before, during and after major emerging market crises demonstrated a feedback effect and unidirectional causality. Furthermore, it confirmed a decrease in portfolio benefits during the crisis and an increase in the post-crisis period. Financial turbulence left its signs not only to advanced economies but also on developing economies in different regions. Global capital flows exhibited collapse and substantial shift during recent crisis push factors like; shocks from advanced countries, particularly from the USA, and macroeconomic policies indeed exerted a significant impact on capital flows from emerging and some advanced economies.

The rise in risk and global financial crisis event triggered a reallocation of funds from emerging to advanced economies for the safety of funds. Volatility in different regional markets influence capital flows in emerging markets because of intra-regional volatilities significant contagion effects exist among different types of capital flows of emerging economies. Such intra-regional effects are stronger for FPI in compassion with FDI, and these effects are stronger for net inflows as compared to gross inflows. Continuing integration in financial markets poses a trade-off for emerging economies. Associated with higher growth and other positive aspects, this situation also makes economies susceptible for global shocks and contagion effects. But comparing with the past, emerging economies did not fall more than advanced economies.

Vulnerability to external crisis slowed down the growth rate and also poverty reduction process. Arguing further, crisis transmitted multiple exogenous shocks to emerging economies, most important among them are the reversal of private capital flows and slump of trading activities. The intensity of two-way capital flows among advanced countries when compared with developing countries reveals the fact that occurrence of gross or net flows reversal is higher in the latter group. Recent turmoil was so severe that economies of the world, from Europe to Asia, could not avoid it (Patev et al., 2006; Fratzscher, 2012; Didier et al., 2012; Lee et al., 2013; Essers, 2013; Calderón & Kubota, 2013).

During the ongoing European crisis, stock volatility returns in China and India turned negative while there was no significant impact on Japan and Hong Kong. During the slow-down phase, because of less or shaky confidence of investors and speculators, China and India experienced less trade than the post-crisis period. Due to the crisis and economic slowdown of the neighboring countries, short-term capital flows to Malaysia were penalized. Though effect was not strong, but capital controls influenced the compositions of capital flows. Although both FPI and FDI were affected during the domestic and global financial crisis, FDI reacted more strongly to the former and FPI responded more to the latter (Uctum & Uctum, 2011; Singhania & Anchalia, 2013; Amin & Annamalah, 2013).

Though numerous studies have been conducted on financial crises, the impact of EIC on FPI in China and India is yet to be explored. Our study contributes to the literature by focusing on these two rival economies in Asia for a particular time span (i.e. 1997-2012). It examines the impact of the external crisis and internal issues on net FPI inflows. Moreover, our study explores and compares the different factors of economic disparity between two economies.

3. China and India during the Last Two Decades

Since the premiership of Deng Xiaoping, China started its economic reforms that helped to boost up the economic growth and took millions of people out of poverty. Initially, the Chinese government emphasized on the import of technology-based products as well as exported its local technology to accumulate foreign exchange reserves. During that time period, as elaborated by Hou (2011), earnings from foreign trade were very difficult due to the strict policies, but it led towards a new era of foreign capital flows, especially FDI. At present, China is the second largest recipient of FDI flows after the USA. The journey did not stop there; in 1994, China decided to adopt more liberal foreign trade policy and its government reduced the tariff on imports during 1996. Later on, China became a permanent member of the WTO in 2001. The Asian financial crisis of 1997 was a big blow for the emerging economies. During this crisis, China experienced a GDP slowdown and its GDP decreased from double to a single digit, but it did not turn negative (Draz, 2011).

The GFC was a big blow for many economies as well as for China. It hit different aspects of the Chinese economy; though exchange rate control and inconvertibility of currency shielded the Chinese economy from the external shocks, this protection proved to be insufficient during the GFC. This crisis increased unemployment, job insecurity and pay cuts in China (Voon & Ma, 2014). The GFC hit various sectors of China including energy, exports and overall GDP. During this crisis, the Chinese exports fell down, consumption of energy also decreased and the GDP growth went down to 7.33% (Yuan et al., 2010). The GFC damaged China's economy more than the Asian Financial Crisis; the short-term capital flows decreased significantly and FPI flows to China decreased by 39% in 2008.

After gaining independence in 1947, India adopted socialism and the economic policies were strict and centralized. During the regime of Indira Gandhi (Prime Minister), efforts for a liberal economy were aborted. When Rajiv Gandhi was in power, opposition against liberalization was not strong as compared to previous reforms period. Although policies became reversed in a couple of years, the economy was much pro-liberal in his era (Sharma, 2011). An alarming situation occurred in the shape of serious budgetary and fiscal deficit along with a perilous balance of payment for the government in 1991. During this dangerous economic and fiscal chaos, foreign currency reserves, as stated by Dongre (2012), dropped down to 1 billion dollars with an annual inflation of 17%.

Due to high fiscal deficit, foreign investors had lost confidence which resulted into an outflow of foreign capital and the Indian government went close to bankruptcy. As a result, India completely liberalized its economy to boost up its economic growth and attract the foreign investment from all over the world. The World Bank data shows that during Asian crisis Indian GDP reduced from 7.54% to 4%. During this period, not only GDP reduced significantly, but trade sector also experienced a slowdown. During the same period, Indian trade account deficit touched the alarming level amounting to 1.6 billion dollars (Nag & Mukherjee, 2012). Since the last decade, the economy of India is flourishing and it is enjoying an average growth rate of 7%.

At present, India is the second fastest-growing economy in Asia after China. The GFC was a massive blow for Indian economy during the recent decade which resulted in a significant decrease in net capital inflows and bank borrowings. During the first half of 2008-09, as Bajpai (2011) mentioned, net capital inflows declined by 63% as compared to last year; during the second half of the same period, net capital flows turned negative due to huge FPI outflows. The World Bank data shows a significant decline in Indian GDP during the crisis. The IMF record shows that during crisis total FPI inflows in India, by the end of 2008, declined by 44% in comparison with the last year.

3.1 FPI Trend

Emerging economies of Asia have been an attractive destination for the foreign investors during the last couple of decades. High growth rates and open policies of these markets increased their engagement in the global market. Participation of the big Asian economies in the world market altered the nature of competition among the economic powers. China, the world's second fastest-growing economy after the USA and the fastest-growing economy of Asia, attracted huge capital flows since 1997 from various parts of the world. India, the second fastest economy of Asia after China, has also become an increasingly important market for the global investors.

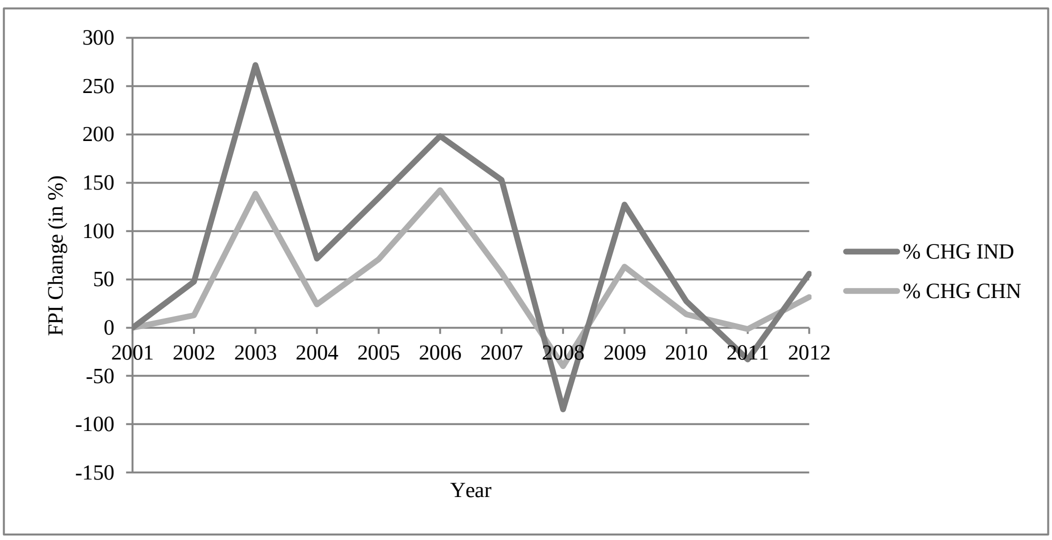

Figure 1. FPI trend in China and India

The percentage changes in the portfolio inflows of India and China during the last decade are presented in Figure 1. Both countries attracted a significant amount of portfolio flows and overall trend of both countries is increasing in comparison with previous year. On average, the percentage increase is higher for China as compared to India and the main decrease can be observed during the GFC. A significant change has been observed in the behavior of portfolio capital flows in emerging economies, especially during the pre-crisis and post-crisis period of the GFC (Ahmed & Zlate, 2014). At present, markets are integrated and spillovers of boom or recession affect economies around the globe.

Being prominent participants of the international market, both China and India could not isolate from the crisis. Both countries experienced a significant decrease in FPI during the GFC, but percentage decrease of FPI for both countries is not similar. The percentage decrease is larger for India as compared to China. The trend of FPI to China is smooth after recovery from the crisis, but a significant reversal occurred in FPI to India, which shows a larger inconsistency factor in the Indian market. Though both countries experienced large foreign capital flows, but a sudden reversal, especially in the Indian market, indicates various internal issues. In the next section, we will discuss internal issues of both countries.

3.2 Major Factors behind Economic Disparity

China and India are among the major economies of Asia and also rank among world’s largest economies. Both countries attracted ample amount of foreign capital both in the shape of FPI and FDI. FPI trend of the last decade is more consistent for China as compared to India. This difference indicates various social, economic, infrastructural and political disparities between two countries that are elaborated as follows:

3.2.1 GDP Growth

Though both countries are enjoying a significant growth rate, but the World Bank data shows that China's GDP is more consistent than India's. Sudden and sharp changes occurred in the Indian economy either at the time of possible economic turmoil or during the boom period. This inconsistent pattern of economic growth reduces the confidence of foreign investors. Therefore, any financial turbulence can cause an ample amount of outflows from the stock markets.

3.2.2 Political Stability

Political stability is a key factor of concern while making an investment decision in any country. Politically volatile economy is always considered less attractive for any type of investment. New government introduces new policies, which may be unfavorable for foreign investors in terms of rules and regulations, investors’ rights and tax. Reversal of policies is a common practice in the less-developed countries like India. On the other side, one party system is in practice in China and the Chinese Communist Party (CCP) is the ruling the country since its establishment; every successor government continues the previous policies and the chances for reversal are very less. This leads towards a greater confidence of investors. As a result, even during the crisis period, outflows are comparatively less for China as compared to India.

3.2.3 Internal Security Issues

Internal security is essential for a smooth working of all walks of life including the economy. Ethnicity, sectarianism and inter-provincial grievances in India and other emerging economies are common phenomena. Ethno-sectarian problems and independence movements, e.g. issues in Assam, Naxalite areas, and occupied Jammu and Kashmir, are some serious threat for the economic stability. Ethnic riots and terrorist attacks are also an important chapter of this tale and Gujarat riots in 2002, and Mumbai attacks in 2008 are the recent examples of this important issue. Accumulation of all these factors makes Indian economy vulnerable for a social and economic crisis. This unpredictable bubble creates a chaos for the foreign investors and huge outflows of funds occur in response to a little economic calamity. On the contrary, no big social issue that can destabilize the economy has emerged in China since the last decade.

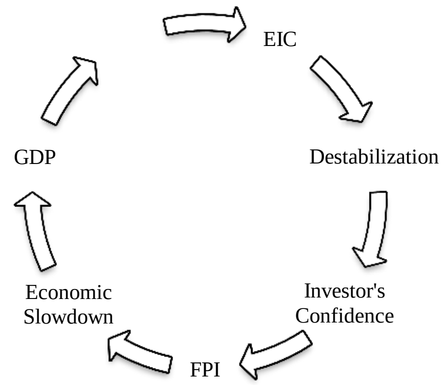

Figure 2. Impact of external and internal crises

3.2.4 Cross Border Relationships

Conflicts with the neighboring countries can cause a serious damage to all sectors of the economy. While investing in a country, the safety of funds, diversification of risk and expectations for return are considered to be the priorities of foreign investors. Unfriendly relations with the neighboring nations are a threat for economic stability and reduce the confidence of foreign investors. China has always tried to boost cooperation with its neighbors. Since the last decade, China has resolved its issues with the neighboring countries through serious diplomatic efforts. Major breakthroughs include an improvement in the Sino-Indian and Russian relationships by table talk. After years of effort, China is now enjoying the benefits of regional cooperation, but Indian relations with the surrounding countries are still a chaos. Since independence, India has fought several wars against Pakistan and both countries are still fighting a proxy war. Both countries are Nuclear Power and their relations are still alarming, which affect the economies of both countries significantly.

3.2.5 Industrialization

Despite its shortcomings, the industrial sector of China is growing with remarkable rates. Industrial transformation of China has moved the Chinese economy into a new orbit. Industrialization not only contributed towards GDP but also opened up opportunities for overseas investors. At present, many multinational companies have opened their franchises in China, which contributes a lot to attract foreign capital inflows. The World Bank reported that China's industrial sector contributed 46.56% to its GDP in 2011. On the other hand, the contribution of India's industrial sector was only 26.7% in the same year; it shows that India is still far behind China in terms of attracting physical capital from other countries. India relies on human capital and a significant portion of its GDP comes from the services sector.

4. Methodology

The study investigates the impact of internal and external issues on FPI of China and India. The net annual FPI inflows are analyzed for the period of 1997 to 2012. External issues refer to the financial crisis, and global financial crisis is the major external shock for both countries since last decade. Internal issues include policy and internal security issues during this period. FPI includes net FPI inflows and the relevant data is collected from the website of the World Bank. The data of GDP growth is also collected from World Bank website. GDP growth and inflation are taken as control variables because GDP indicates the performance of various sectors. Higher and comparatively consistent growth rates are helpful to strengthen the investors' confidence, which results into hot capital inflows in a country.

Binary Choice Model has been used for analysis in this paper because the data of financial crisis and internal issues is discrete so, Least Square method is not an appropriate measure for current data. Model is further divided into three types, i.e. Logit, Probit, and Extreme values. Binary models, as Hosmer & Lemeshow (2000) stated, are applied to analyze such situations in which dependent variables can only have two possible outcomes i.e. (yes, no) or (1, 0), where 1 indicates the presence and 0 signifies the absence. Like other forms of regression, in binary models one or more predictors (independent) variables are used. Variables in our model are abbreviated as follows:

Foreign Portfolio Investment = FPI {Dependent Variable}

Gross Domestic Product = GDP {Independent Variable}

External and Internal Crisis = EIC {Independent Variable}

Inflation =IFN {Independent Variable}

Whereas:

$$EIC = \begin{cases} 1, \text{External \& Internal Crisis} \\ 0, \text{Otherwise} \end{cases} \quad \text{and} \quad FPI = \begin{cases} 1, \text{Increase} \\ 0, \text{Otherwise} \end{cases}$$

Where EIC is a dummy variable applied to identify the presence or absence of a crisis. The hypotheses of our study are as follows:

H_{01}: There is no significant relationship between external and internal crisis and net FPI inflows of China / India

H_{11}: There is a significant relationship between external and internal crisis and net FPI inflows of China / India

5. Results and Discussion

This section represents various estimations, results and discussion. Descriptive summary of variables including dependent variable of China is presented in Table 1, which shows that IFN has the highest standard deviation; GDP indicates higher mean, kurtosis as well as higher value of JB. Summery statistics of China and India are shown in Table 1 below:

Table 1. Descriptive statistics

Country	Measures	IFN	EIC	FPI	GDP
	Mean	1.8998	0.3750	0.6250	9.6937
	Median	1.6442	0.0000	1.0000	9.3000
	Std. Dev.	2.3193	0.5000	0.5000	1.8031
China	Skewness	0.2251	0.5163	-0.5163	1.1178
	Kurtosis	1.8874	1.2666	1.2666	3.7118
	Jarque-Bera	0.9603	2.7140	2.7140	3.6760
	Mean	6.9298	0.3125	0.6875	6.7594
	Median	6.2577	0.0000	1.0000	7.0896
India	Std. Dev.	3.1715	0.4787	0.4787	2.4815
	Skewness	0.6386	0.8090	-0.8090	-0.0494
	Kurtosis	2.1259	1.6545	1.6545	1.5089
	Jarque-Bera	1.5970	2.9522	2.9522	1.4886

Source: Authors' analyses in Eviews.

In China's case, inflation has the highest SD, the skewness of FPI is negative, but kurtosis and JB are less than 3. We have applied the ADF and PP test to check stationary properties of data with the null hypothesis that data is non-stationary at 5% level of significance. The critical values provided by MacKinnon.

Table 2. Unit root analysis

Country	Variables	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)	
		ADF test statistic	Critical value	PP test statistic	Critical value
	FPI	-4.031129	-3.081002	-4.028423	-3.081002
	GDP	-3.517462	-3.098896	-3.519488	-3.098896
China	EIC	-4.031129	-3.081002	-4.028423	-3.081002
	IFN	-7.699243	-3.119910	-9.206028	-3.098896
	FPI	-6.244998	-3.081002	-6.244998	-3.081002
India	GDP	-4.364932	-3.098896	-5.631745	-3.098896
	EIC	-4.048036	-3.098896	-4.457145	-3.081002
	IFN	-5.679849	-3.098896	-5.288583	-3.098896

Source: Authors' analyses in Eviews.

Results for both countries are presented in Table 2 confirming that all variables are stationary at 5% level of significance. Therefore, we reject our null hypothesis.

Correlation matrix for both countries is shown in Table 3. The values of correlation are significantly small, which indicates that there is no multicollinearity among the variables.

Table 3. Correlation analysis

Country	Variables	INF	GDP	FPI	EIC
	INF	1.000000			
	GDP	0.449633	1.000000		
China	FPI	-0.178381	0.100750	1.000000	
	EIC	0.241545	0.121085	-0.733333	1.000000
India	INF	1.000000			
	GDP	0.069664	1.000000		
	FPI	-0.277895	0.236824	1.000000	
	EIC	0.213097	-0.281769	-0.709090	1.000000

Source: Authors' analyses in Eviews.

The results of Binary Choice Model demonstrate that, with 5% level of significance (i.e. $\alpha = 0.05$), a significant relationship exists between net FPI inflows and the external and internal crisis of China and India. All methods (i.e. Probit, Logit and Extreme Values) indicate a significant impact of EIC on FPI net inflows. Hence, we reject our null hypothesis (H_{01}) that there is no significant relationship between EIC and FPI net inflows of China and India. Moreover, the relationship of GDP and FPI net inflows varies for both countries; all methods of our model indicate an insignificant relationship between India's GDP and FPI net inflows, however, a significant but weak relationship exists between China's GDP and FPI net inflows.

Table 4. Binary choice model – China

Method	Variables	Coefficient	Std. Error	z-Statistic	Prob.
	EIC	-2.659179	1.080830	-2.460311	0.0139
Binary - Probit	GDP	0.379541	0.324684	1.168954	0.2424
	IFN	-0.161597	0.289248	-0.558681	0.5764
	EIC	-4.421092	1.965038	-2.249876	0.0245
Binary - Logit	GDP	0.614971	0.565604	1.087284	0.2769
	IFN	-0.296457	0.527733	-0.561756	0.5743
Binary - Extreme	EIC	-3.214372	1.374338	-2.338852	0.0193
Values	GDP	0.439070	0.417040	1.052825	0.2924
	IFN	-0.223553	0.387236	-0.577304	0.5637

Source: Authors' analyses in Eviews.

Table 5. Binary choice model – India

Method	Variables	Coefficient	Std. Error	z-Statistic	Prob.
	EIC	-2.099687	0.897023	-2.340727	0.0192
Binary – Probit	GDP	0.028527	0.177988	0.160276	0.8727
	IFN	-0.102899	0.146975	-0.700111	0.4839
Binary – Logit	EIC	-3.529241	1.618636	-2.180379	0.0292
	GDP	0.102292	0.324844	0.314897	0.7528
Binary - Extreme	IFN	-0.197235	0.270972	-0.727879	0.4667
Values	EIC	-2.859514	1.251741	-2.284429	0.0223
	GDP	0.162272	0.252303	0.643163	0.5201
	IFN	-0.174854	0.214922	-0.813568	0.4159

Source: Authors' analyses in Eviews.

Our results are theoretically reliable. As compared to India, China experienced remarkable growth rates, less fluctuation in growth, better governance, improved infrastructure and stable political and internal security situation. Therefore, China attracted ample amount of foreign capital by the virtue of its development in various sectors.

6. Conclusion

This study investigates the relationship between external and internal crisis (EIC) and net inflows of FPI for China and India. We have used GDP and inflation as control variables and applied Binary Choice Model taking the EIC as a dummy variable for both countries. The statistical results suggest that net FPI inflows are significantly influenced by EIC. Regardless of the impact, the nature of internal issues is different for both countries. Meanwhile, the relationship between GDP and net FPI inflows is not strong. Our study reveals that China's internal issues, i.e. appreciation of the currency, pegging, and un-pegging with the USD, are mostly related to its policy measures because there is a tradeoff between inflation rate and the surge of inflows into the country. Therefore, policy makers can look into the timing and impact of certain policy measures on inflation control and its relative impact on FPI inflows. Moreover, China needs to sustain its growth rate and carefully design the competitive policies to attract the foreign investors.

On the contrary, we found that India is undergoing serious internal security, societal and regional problems. In addition, its GDP is not as consistent as China's and investors react strongly against all these issues. Therefore, India should pay attention to remove ethnic, social and economic inequalities in order to reduce the internal security threats. Furthermore, serious efforts are required to maintain friendly relations within the neighboring countries, which will be useful in enhancing the investors' confidence and sustaining the growth rate.

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Assessing the Impact of S&P SL20 Index Construction on Listed Companies in Colombo Stock Exchange (CSE)

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Abstract

A stock market index is designed to measure the performance of value of a set of stocks. The set of stock can be entire market of a particular country or a sector. Indices can be used not only to see how the stock market, for instance, has changed over time, but it allows easy comparison between stocks that represent different sectors or even different stocks. An index construction or rebalancing of existing index is a major market event that investor might know before the event take place. The index inclusion reflects a positive situation about the quality, risks and possible future return of the stock. This study examine whether any price and trading volume effects arise from S&P SL 20 index construction. S&P SL 20 index was launched in 26, June 2012, based on 20 blue chip companies in Sri Lanka. The current study employs the standard event study methodology to identify the abnormal returns associated with the launching of the S&P SL 20 index. Three normal return benchmarks, namely the market-adjusted model, mean-adjusted model and the market model have been used for the purpose of finding abnormal returns. Price series and volumes of stocks in S&P SL 20 list (after and before) were considered and those are retrieved from Colombo stock exchange.

The study finds that the abnormal returns following the launch of the S&P SL 20 index is statistically insignificant.

Keywords: event studies, stock market index, hypothesis testing, financial markets, macroeconomy

1. Introduction

1.1 Introduce the Problem

A stock index is a collection of financial instruments which are used to represent either sector of a stock exchange or the whole market. Each of these indices has a different mechanism of calculation. Among the different types of market related and non-market related events, this study focuses the impact of stock index construction. In particularly, we study the impact of launching of S&P SL 20 index on the listed companies performance.

The S&P SL20 Index was initiated on 18 June 2012 and was launched in Colombo on 26 June 2012. The S&P Sri Lanka 20 seeks to be comprised of liquid and tradable stocks for easy and cost effective replication as trading instruments, with possible application as index funds and Exchange-Traded Funds (ETFs). Index constituents are the 20 largest blue chip companies (see Table 1) chosen from the universe of all stocks listed on Colombo Stock Exchange. The indices are calculated using a capped market capitalization-weighting scheme (capped at 15%). The S&P Sri Lanka 20 is calculated in Sri Lankan Rupee. The base period of the S&P Sri Lanka 20 is December 17, 2004. The base value is 1000.

This study explores the effect of the construction of S&P SL 20 index in 26th June 2012 on the companies included in it. We consider 16 companies out of 20 which are listed since the beginning of the index and compare their daily stock performance three years before and after the event took place. In this paper we take a different study to examine the effect of introduction of a new Index on the performance of the listed companies. For this we take a pre- and post- event windows of size three years, as the impact should be long term. We will study the price effects of the stocks after the introduction of the new Index.

This study intends to answer the following research questions:

RQ1: Is there a change of the price efficiency when the stock is included to the index?

RQ2: Does a significant correlation exist between the returns of stocks that are added to the index?

RQ3: Does a significant correlation exist between the stocks that are added to the index in the same market segment?

RQ4: Is there a correlation between the returns of stocks added to the index and not added stocks in the same market segment?

RQ5: To what extent the index construction announcement affect the added stock of the index and also to the other stocks in the market? What causal relationship does there exist between the stocks? What are the specific reasons?

1.2 Significance of the Study

A stock index or stock market index is a measurement of the value of a section of the stock market. It is computed from the prices of selected stocks (typically a weighted average). It is a tool used by investors and financial managers to describe the market, and to compare the return on specific investments.

Therefore, the S&P SL 20 can be considered as a performance measure of Colombo stock exchange. As far as author concerns, the impact of launching of S&P SL 20 index have not investigated. The findings of the research will be important to all market participants such as investors, managers of the companies and stock exchange regulatory agencies in their decision-making in Sri Lanka and Asian region.

Event study methodology has been extensively used in finding impact of index reconstitution. But as far as literature concerns, the research done in finding out impact of the launching of a new index are limited. So this study address this gap in the literature and establishes that effect of launching of an index can be studied using event study framework.

1.3 Literature Review

Using financial market data, an event study measures the impact of a specific event on the value of a firm (Mackinlay, 1997). Event study framework, which was first introduced by Dolley (1933) where he focused on the price effect of splitting common shares. Since then event studies have being extensively used in measuring impact of a specific event on the value of a firm. In the recent history it has been widely used in impact analyzing of index reconstitution, and listing (delisting) in indices, for example, Shankar (2006) and Liu (2006; 2010).

The main hypotheses offered to explain effects of changes in the index on stock return and volume are categorized into four types. These are:

- price pressure hypothesis
- imperfect substitutes hypothesis or downward-sloping demand curve
- liquidity hypothesis and
- information signaling hypothesis

Various studies have been conducted to analyze the temporary and permanent effects of adding (deleting) from an Index. Shankar (2006) supports the temporary price-pressure hypothesis with regards to changes in S&P SmallCap 600 Index. Liu (2006; 2010) supports this hypothesis where he considers effects of Japanese Nikkei 225 and Nikkei 500 rebalancings. In contrast, Chen (2006) supports the idea of imperfect substitutes hypothesis in explaining the index effect. Here Chen uses data on additions to U.S. Russell indices. Another study which supports this idea of permanent price effects is Yun (2010) which investigates the effects of reconstitution of Korean KOSPI (Korean stock index futures and options) 200 index. Bildik (2008) supports the hypotheses of price-pressure and imperfect substitute. Bildik carried out his study on ISE (Istanbul Stock Exchange).

Almost all of the previous mentioned studies assess the impact of an event occurring multiple times. As far as literature concerns it is hard to find event studies on a one time occurring event. One such example is done by Selvam (2007) with reference to September 11, 2001 terrorist attack in US and its impact on Asian stock markets. He mentions that among the Asian stock markets, Indian stock markets are more resilient than in the past and they recovered sooner from terrorist attacks than other Asian stock markets.

Therefore, our study is going to fill this gap in literature by adding one more example of an event study on an impact of single event.

Being a relatively new index, S&P SL 20 index has been appearing only recently in literature.

In one of those handful of studies Nandani (2015) proposes two forecasting models for the S&P SL20 index: namely, a 30-10-1 feedforward artificial neural network and an ARIMA(1,1,1) model. Another study by Sooriyakumar (2015) identifies CAPM as an appropriate model to predict the price or returns of assets with regards to S&P SL20 index.

Fernando (2014) analyzed the liquidity formation of S&P SL 20. The main focus of the study was the depth of trading liquidity. They report that three possible influences on depth; timing, market condition and trading volume, has no material impact on trading liquidity of sample stocks.

In a similar study, Piyananda (2014) makes a comparison between daily returns of the two main indices in Colombo Stock Exchange; namely the Standard and Poor's Sri Lanka 20 and All Share Price Index and concludes that there is no statistical difference in variance and mean returns of the two indices. But they suggests that ASPI reports a higher return per unit of risk compared to S&P 20.

Another study by Jeyasreedharan (2015) to examine the days of the week (DoW) effect of S&P SL 20 index indicates that DoW effects were weak during the war period but strong during the post-war period. However, when potential ARCH effects were taken into account, both periods showed evidence of strong DoW effects, indicating the Day-of-the-Week effect to be an anomaly rather than an illusion.

In a related study Wijeweera (2015) establishes that there is a statistically significant relationship between terrorist attacks and financial market performance using Sri Lanka's ASPI and S&P SL 20 indices.

All these studies suggest that S&P SL 20 index is becoming popular and interesting topic for researchers.

1.4 Objectives and Hypotheses

The objectives and relevant hypotheses to answer the research questions of the study are organized are as follows:

Objective 1

It is expected to investigate the price efficiency of the stock added from the index after the date of announcement and before and after the effective date of the change by selecting suitable event windows. This will help to answer RQ1.

Ha_0 =Mean day '0' trade volume is equal to mean trade volume

Ha_1= Mean day '0' trade volume is not equal to mean trade volume

Objective 2

It is expected to investigate the correlation between the returns of the stocks that are added to the index after the date of announcement and before and after the effective date of the change by selecting suitable event windows. This will help to answer RQ2.

We will use t-test for testing the population correlation coefficient ρ.

Hb_0 = There exists no correlation between the returns of the stocks that are added to the index, i.e., $\rho=0$

Hb_1= There exists a correlation between the returns of the stocks that are added to the index, i.e., $\rho\neq0$

Objective 3

It is expected to investigate the correlation between the stocks that are added to the index in the same market segment after the date of announcement and before and after the effective date of the change by selecting suitable event windows. This will help to answer RQ3.

Hc_0= There exists no correlation between the stocks that are added to the index in the same market segment

Hc_1= There exists a correlation between the stocks that are added to the index in the same market segment

Objective 4

It is expected to investigate if there is a correlation between the returns of stocks added to the index and not added stocks in the same market segment after the date of announcement and before and after the effective date of the change by selecting suitable event windows. This will help to answer RQ4.

Hd_0= There is no correlation between the returns of stocks added to the stock and not added stocks in the same market segment

Hd_1= There is a correlation between the returns of stocks added to the stock and not added stocks in the same market segment

Objective 5

It is expected to investigate to what extent the index construction announcement affect the added stock of the index and also to the other stocks in the market after the date of announcement and before and after the effective date of the change by selecting suitable event windows. This will help to answer RQ5.

He_0= There is no causal relationship in the stocks added stock of the index and also to the other stocks in the market

He_1= There is a causal relationship in the stocks added stock of the index and also to the other stocks in the market

2. Method

To understand the impact of earnings surprises on stock prices, and thus to discover if there are any trends or patterns useful for trading, we perform an event study. The event study framework was first introduced by Dolley (1933) where he focused on the price effect of splitting common shares. Mackinlay (1997); Shankar (2006); Liu (2006; 2010); Chen (2006); Yun (2010) and Bildik (2008) are few examples for the vast literature which uses event study methodology in assessing impact of various market events.

An Event study is a statistical method to assess the impact of an event on the value of a firm. The basic idea is to find the abnormal return attributable to the event being studied by adjusting for the return that stems from the price fluctuation of the market as a whole.

We take the launching of the index as our event. Our aim is to check if stock prices after the event display abnormal returns (i.e. returns in excess of their expected return after compensating for risk). The traditional event study methodology of Fama, Fisher, Jensen, and Roll (1969) involves calculating cumulative average abnormal returns (“CAARs”).

2.1 Event Study Time Line

Define:

$\tau=0$ as the event date,

$\tau=T_0+1$ to $\tau=T_1$ constitutes the estimation window

$\tau=T_1+1$ to $\tau=T_2$ represents the event window

$\tau= T_2 +1$ to $\tau = T_3$ is the post event window

$L_1 = T_1- T_0$ be the length of the estimation window

$L_2 = T_2- T_1$ be the length of the event window

$L_3 = T_3- T_2$ be the length of the post event window.

An important assumption throughout the event-study methodology is that the event is exogenous with respect to the change in market value of the security.

This study uses launching of S&P SL20 index as the “event” where any occurrence that affects the share price or the value of the firm. Johnson (1998), defined “event date” is the date on which the effect of an event is presumed to take place, or the date around which a diffused effect is presumed to be distributed. The “event date” is the first market date on which the market participants can respond to the event. The “event date” (day 0) is also called as launching of the S&P SL20 index date in this study. It is the market date on which it is publicly announced. This announcement is conveyed to the market participants through the Stock Market Daily (SMD) which is the official publication of the CSE.

In our study we define event window [-20,+20]. Hendricks and Singhal (1996) cite two reasons to use a shorter event period: one, a shorter event period permits a better estimation of the effects of information of stock prices since it reduces the possibility of other confounding factors not related to the announcement. Two, it also increases the power of the statistical tests.

Previous researchers used different lengths of estimation period and event period for their studies. Among them, Brown and Warner (1985), used 250 days (239 days for estimation period and 11 days for event period). Pettit (1972), used 12 month period prior to the dividend announcement date. Bandara (2001), Bandara and Samarakoon (2002), used 200 trading days for the estimation period and 121 trading days for event period. This study uses 105 trading days for estimation period and 41 trading days for event period.

Daily closing price for the total period of 146 days is included the 105 days of estimation period (-21,-127) and the window period of 41 days. In the literature the estimation period, of size between 120 – 200 days used in most studies, is the period immediately before the event window (Telang, and Wattal, 2005). According to Peterson (1989) typical length of the estimation period ranges from 100 to 300 days for daily studies. A longer estimation period will improve the prediction model while model parameters may become instable.

In order to compute the Expected Returns (ERs) for the event period, it is required to estimate test parameters for Beta (β) and Alpha (α). The estimation period starts with -21 day from the event date and it goes back to 105 trading days. It is identified as -127 day to -21 day. All the days referring to the estimation period must be trading days. The event period goes back to 20 trading dates and immediately after the event date again it goes up to 20 trading dates. Therefore, totally it consists of 21 trading dates. Typical lengths of the event period range from 21 to 121 days for daily studies (Peterson, 1989).

Finally, the total period to be reviewed is 146=(105+41) trading days which is considered as the analysis period. It is important to identify the behavior of ARs to compare with the actual stock returns and expected stock returns surrounding the dividend announcement date.

2.2 Event Study Process

Step 1: Calculate daily abnormal returns ("ARs") for each firm in the days surrounding the event being studied. Daily ARs can be calculated using various benchmarks:

1. Market-adjusted-return model (M1)
2. Mean-adjusted-return model (M2)
3. Risk-adjusted-return model (M3)

In stock market trading, abnormal returns are the differences between a single stock or portfolio's performance and the expected return over a set period of time.

Browner and Warner (1985) suggest the use of a value-weighted index as a market index. We use All Share Price Index (ASPI) as the benchmark for expected return which is according to CMIC (2013) a value-weighted index.

Abnormal Return = Actual Return – Expected Return

$$AR_{(i,t)}=R_{(i,t)}-E(R_{(i,t)}) \quad (1)$$

Step 2: Calculate the average abnormal return ("AAR") for each day in the event window.

This aggregates the abnormal returns for all N stocks to find the average abnormal return at each time t. This helps eliminate idiosyncrasies in measurement due to particular stocks.

$$AAR_t=1/N \quad \Sigma^{N}{}_{i=1} AR_{(i,t)} \quad (2)$$

Step 3: Finally, sum the average abnormal returns over the T days in the event window (i.e. over all times t) to form the cumulative average abnormal return (CAAR).

$$CAAR_T=\Sigma^{\ T}{}_{t=1} AAR_t \quad (3)$$

2.3 Models for Measuring Normal Performance

$$AR_{it}=R_{it}-(\alpha_i+\beta_i R_{mt}) \quad (4)$$

Following three models will be used for measuring the normal performance of the market.

2.3.1 Mean-Adjusted Return Model (M2)

Here the expected return of a security is equal to a constant, estimated by averaging the series of past returns over the pre-identified estimation window. It assumes that the expected return of a security is equal to its historical mean. i.e. α_i= average return over the estimation period (historical mean of the stock) and β=0. This does not account for market-wide factors. This model has been used by Kalay and Loewenstein (1985) and Mackinlay (1997).

2.3.2 Risk-Adjusted Return Model (M3)

$$R_{it}=\alpha_i+\beta_i R_{mt}+\xi_{it} \quad (5)$$

where $E(\xi_{it})=0, var(\xi_{it})=\sigma_{\xi}^2$. The market model represents a potential improvement over the constant-mean-return model. By removing the portion of the return that is related to variation in the markets return, the variance of the abnormal return is reduced.

Compared to the Market-Adjusted and Mean-Adjusted models, this model is more sophisticated as it accounts for both market wide and firm specific factors of each security.

The OLS estimators of the market-model parameters using an estimation window of L_1 observations are

$$\hat{\beta}_i = \frac{\sum_{\tau=T_0+1}^{T_1}(R_{i\tau}-\hat{\mu}_i)(R_{m\tau}-\hat{\mu}_m)}{\sum_{\tau=T_0+1}^{T_1}(R_{m\tau}-\hat{\mu}_m)^2} \quad (6)$$

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i\,\hat{\mu}_m \quad (7)$$

$$\sigma_{\xi_i}^2 = \frac{1}{L_1-2}\sum_{\tau=T_0+1}^{T_1}\left(R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i\,R_{m\tau}\right)^2 \quad (8)$$

where

$$\hat{\mu}_i = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{i\tau} \quad (9)$$

and

$$\hat{\mu}_m = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{m\tau} \quad (10)$$

R_{it} and R_{mt} are the return in event period for security i and the market respectively.

2.3.3 Market-Adjusted-Return Model (M1)

Setting $\alpha_i=0,\beta_i=1$ we have $\xi_{it}=R_{it}-R_{mt}$ as the market-adjusted-return. This is feasible when estimation window is not available but should be used with caution.

The underlying assumption in this model is that the expected returns of a security is equal to the market return. Thus, it considers that the expected return is constant across securities but not across time. The model only accounts for market wide movements, which occur at the same time that the sampling firms experience the event. Consequently, all market-wide movements are eliminated from the stock returns when deriving the excess returns on and around the event. Model may appeal to the average investor who looks for strategies of above market returns in managing their portfolios. However, in general, scholars consider this model as a restricted one as it is mostly applied in situations where availability of data is limited. Scholars like DeBont and Yonesava (1985) and Gunaratne (2009) have employed this model to estimate the excess returns in different contexts.

2.4 Hypothesis Testing: P-Value Approach

We used p-value approach in Hypothesis testing. Following are the steps followed in this procedure:

1) Specify the null and alternative hypotheses.
2) Using the sample data and assuming the null hypothesis is true, calculate the value of the test statistic.
3) Using the known distribution of the test statistic, calculate the p-value.
4) Set the significance level, α. Compare the p-value to α. If the p-value is less than (or equal to) α, reject the null hypothesis in favor of the alternative hypothesis. If the p-value is greater than α, do not reject the null hypothesis.

2.4 Data Collection

For our study, we obtained daily volume figures and closing stock prices of the ASPI index and S&P SL 20 Index and performance of 16 listed companies (Table 1) in the Index since the beginning for the period between June 2009 and June 2015. The data was obtained from Colombo Stock Exchange website at https://www.cse.lk/historical_trades.do. This study period contains 1378 daily observations (open, high, low, close, trade volume, share volume and turn over) for each company excluding the weekends and holidays.

We will be using the Eviews 6 in the preliminary analysis of the data and hypotheses testing. The event study will be carried out using the Matlab 2007.

3. Results

3.1 Statistics and Data Analysis

The mean, standard deviation, skewness and kurtosis of the log returns for each of the 16 companies were calculated for the whole period and then for the periods before and after constructing the index as shown in Table

2. We can see that the mean is approximately equal to one for the whole period, period before and after, but mean is slightly larger for before event period than the after event period. Standard deviation is nearly 0.01 for the three periods considers, but usually larger in the before event period.

We have more than 3 for kurtosis for most of the companies, especially prior to the event, therefore the distributions are more peaked. Only Commercial Bank, Cargills, Nestle and Ceylon Tobacco has significant kurtosis in the after event period. For almost all of the companies in the three periods considered, the skewness is between -1 and 1 (except for Nestle and Tobacco) so the distributions are symmetrical.

From above observations we can see that the daily stock return for an individual security exhibits substantial departures from normality. The evidence generally suggests that distributions of daily returns are fat-tailed relative to a normal distribution (Fama, 1976, p. 21).

Figure 1 graphs the stock prices of the 16 companies during the event period. The daily closing pricings during the event window for most of the companies shows a level trend except for DFCC (which has an upward trend) and TELECOM (which shows a small peak around the event). Other than that the prices exhibit no apparent radical movement on the event day.

However, the average daily percentage return of these sixteen listed companies, seen in Figure 2, did exhibit common movement on that day. The event day records the lowest (positive) average daily return for the sixteen companies during the total 41 days in the event window.

As the Figure 3 further points out, at the event day occurs the highest total share volume (nearly 70 million blocks traded) – a volume five times larger than the next largest share volume, during the event window.

Figure 4 graphs the total trade volume of the sixteen companies during event window. One can see although at the event day there's a small local peak, there is an overall decreasing trend (with oscillations).

To quantify this we will test the following hypotheses in Objective 1:

Ha_0 =Mean day '0' trade volume is equal to mean trade volume

Ha_1= Mean day '0' trade volume is not equal to mean trade volume

We use the test statistic:

$$t=(x \square -\mu)/SE \tag{11}$$

where SE =sd(x)/ √ n and n is the number of samples.

With mean trade volume 360.2927 and t- statistic -4.8548 we can reject the null hypothesis Ha_0 at the 0.05 significance level (p-value 1.000).

We can answer "RQ1: Is there a change of the price efficiency when the stock is included to the index?" in affirmation. There is evidence that a change of the price efficiency is happened when the index is introduced.

Now we will test the hypothesis

$Hb_0 = \rho=0$ vs. $Hb_1= \rho\neq 0$

We use the test statistic:

t=(r √ (n-2))/ √ (1-r^2)

where r is the correlation coefficient.

We have r=-0.2584 and t-statistic -1.0614 (p-value is 0.8491>0.05) and we cannot reject the null hypothesis. There is sufficient statistical evidence at the $\alpha = 0.05$ level to conclude that there is no significant correlation between the returns before and after the event of the stocks that are added to the index. That is the patterns of the prices are different before and after the introduction of the index.

Next we will consider the correlation between the returns of the stocks that are added to the index. The correlation coefficient and p-values between the sixteen companies are shown in Tables 3 and 4, respectively.

As Table 4 highlights there are few significant correlations among the sixteen companies at significance level 0.01. When we consider sector breakdown as shown in Table 5 most of these correlations are due to being part of the same sector. For example, Commercial Bank, DFCC, NDB all belong to (Banking, Finance and Investment) BFI sector all correlated significantly. Also, Bukit which also involves in food manufacturing shows significant correlation with other companies from Beverage, Food and Tobacco (BFT) sector: Distillieries and Nestle. John Keells which also involves in Investment sector shows significant correlation with NDB which is from BFI industry. So most of this correlation is due to being part of the same sector, and others can be discarded as to mere coincidence.

We can answer "RQ2: Does a significant correlation exist between the returns of stocks that are added to the index?" yes, mostly due to being part of the same sector, which assertion we will be investigating next in more detail.

It is expected to investigate the correlation between the stocks that are added to the index in the same market segment after the date of announcement and before and after the effective date of the change by selecting suitable event windows.

Hc_0= There exists no correlation between the stocks that are added to the index in the same market segment

Hc_1= There exists a significant correlation between the stocks that are added to the index in the same market segment

Table 5 shows the sector breakdown of the S&P SL 20 Index.

As the Table 6 lists out we can see that there is significant correlation between the stocks that are added to the index in the same market segment in some of the segments of concern at the significance level 0.01.

So we can answer "RQ3: Does a significant correlation exist between the stocks that are added to the index in the same market segment?" as only to some extent.

As the fourth objective, it is expected to investigate if there is a correlation between the returns of stocks added to the index and not added stocks in the same market segment after the date of announcement and before and after the effective date of the change by selecting suitable event windows.

Hd_0= There is no correlation between the returns of stocks added to the index and not added stocks in the same market segment

Hd_1= There is a correlation between the returns of stocks added to the index and not added stocks in the same market segment

As the Table 7 lists out we can see that there is evidence to reject the null hypothesis that there exists no significant correlation between the stocks the returns of stocks added to the index and not added stocks in the same market segment in all the segments of concern at the significance level 0.05. Figure 6 further emphasize this which shows very strong positive correlation in Oil Palms and BFT sectors and strong positive correlation in Telecommunication and BFI sectors. Diversified and Manufacturing sectors also show moderate positive correlation at the significance level 0.05.

Now we can answer the question:

RQ4: Is there a correlation between the returns of stocks added to the index and not added stocks in the same market segment? Yes. There exists significant correlation between the stocks that are added and not added in the same market segment, which shows that index represents market behavior.

It is expected to investigate to what extent the index construction announcement affect the added stock of the index and also to the other stocks in the market after the date of announcement and before and after the effective date of the change by selecting suitable event windows.

He_0= There is exists no correlation between the stocks added stock of the index and also to the other stocks in the market

He_1 = There is exists a correlation between the stocks added stock of the index and also to the other stocks in the market

Figure 9 is a graph of ASPI returns vs. sixteen companies' average returns for the 41 days in the event window. The line drawn through these plots reflects the sample returns that would be expected, given a market return on a specific day and the average sample beta 0.6831. The data point of day 0 which is indicated in black square is not that significant from zero and lies near expected value.

We selected 5 companies (Note 1) from the CSE which are never listed in S&P SL 20 but have next highest market capitalization to compare against the listed companies' performance (see Table 10).

As Figure 10 shows there is no common movement on the event day in the stocks of the selected 5 companies. However, as the Figures 11 to 13 illustrate there is some strange behavior on the event day (day 21 in the figures). Average daily return is largely negative (minimum for the 41 days in the event window) and also total share volume is very low during the event day. This shows that there was some impact on the nonlisted companies in the S&P SL 20 from the launching of the index.

Figures 14, 15, 16 and 17 shows the average abnormal returns (AAR), cumulative average abnormal returns (CAAR), error for the CAAR and t-statistic, respectively, for the average returns of the selected companies from S&P SL20 index for the three market models: M1, M2 and M3.

According to Figure 14 AAR is the lowest at the event day with reference to all three model. Figure 15 further emphasize this fact by showing overall downward trend in the cumulative average abnormal returns. Figure 16 indicates that the error is within ±0.15 and Figure 17 shows that the t-statistic is also insignificant.

We further see that the S&P SL20 index and ASPI index moves unison after the event by plotting the values and returns (Figure 18) and the CAARs (Figure 19) for the two indices for the 621 trading days following the examination period. This can be explained as S&P SL 20 Index market capitalization is 77,629.45 LKR millions (Note 2) which is nearly 52.95% of the total market cap (S&P, 2015) and so it truly represents the total market behavior (Note 3).

Table 1. The mean, standard deviation, kurtosis of the log returns for each of the 16 companies for the whole period, and for the periods before and after constructing the S&P SL20 index

Company Name	Symbol	Market Capitalisation (Rs.)	Market Cap/Total Market Cap (%)	Beta Values Against S&P SL20 (As of First Quarter of year 2015)
ACCESS ENGINEERING PLC*	AEL.N0000	0.00	0.00	1.10
AITKEN SPENCE PLC	SPEN.N0000	40,640,204,800.00	1.50(%)	0.92
BUKIT DARAH PLC	BUKI.N0000	67,840,200,704.00	2.50(%)	0.54
CARGILLS (CEYLON) PLC	CARG.N0000	31,920,001,024.00	1.17(%)	0.06
CARSON CUMBERBATCH PLC	CARS.N0000	78,554,767,360.00	2.89(%)	0.88
CEYLON TOBACCO COMPANY PLC	CTC.N0000	166,755,598,336.00	6.14(%)	0.79
CHEVRON LUBRICANTS LANKA PLC	LLUB.N0000	49,103,998,976.00	1.81(%)	0.86
COMMERCIAL BANK OF CEYLON PLC	COMB.N0000	139,377,967,104.00	4.74(%)	1.46
DFCC BANK PLC	DFCC.N0000	52,515,852,288.00	1.78(%)	0.93
DIALOG AXIATA PLC	DIAL.N0000	92,024,692,736.00	3.13(%)	1.62
DISTILLERIES COMPANY OF SRI LANKA PLC	DIST.N0000	84,360,003,584.00	2.87(%)	0.62
HATTON NATIONAL BANK PLC	HNB.N0000	71,074,545,664.00	2.41(%)	0.99
JOHN KEELLS HOLDINGS PLC	JKH.N0000	220,017,688,576.00	7.47(%)	1.15
LANKA ORIX LEASING COMPANY PLC*	LOLC.N0000	50,608,799,744.00	1.72(%)	0.88
LION BREWERY CEYLON PLC*	LION.N0000	50,007,998,464.00	1.70(%)	0.84
NATIONAL DEVELOPMENT BANK PLC	NDB.N0000	45,421,019,136.00	1.55(%)	1.13
NESTLE LANKA PLC	NEST.N0000	108,256,804,864.00	3.68(%)	0.36
PEOPLE'S LEASING & FINANCE PLC*	PLC.N0000	39,338,573,824.00	1.34(%)	1.21
SAMPATH BANK PLC	SAMP.N0000	45,318,230,016.00	1.54(%)	0.89
SRI LANKA TELECOM PLC	SLTL.N0000	88,438,136,832.00	3.01(%)	0.38

Note. Companies indicated by * mark are excluded from the calculations as they did not appear in the initial list.

Table 2. The mean, standard deviation, kurtosis of the log returns for each of the 16 companies for the whole period, and for the periods before and after constructing the S&P SL20 index

Company	Total				Before				After			
Name	Mean	SD	Kurtosis	Skewness	Mean	SD	Kurtosis	Skewness	Mean	SD	Kurtosis	Skewness
Aitken Spence	0.9999	0.0126	5.5219	0.4669	0.9996	0.0118	2.9023	-0.1402	1.0000	0.0127	5.8127	0.5425
Bukit Darah	0.9996	0.0158	6.4612	0.5141	0.9978	0.0258	1.6965	0.1959	0.9998	0.0134	7.8921	0.9356
Cargills	0.9997	0.0193	4.1898	-0.0804	0.9971	0.0222	5.1513	-0.9154	1.0001	0.0187	3.6578	0.1813
Carson	0.9998	0.0177	4.0188	0.4386	0.9989	0.0168	1.7816	-0.7955	0.9999	0.0178	4.2833	0.6110
Chevron	1.0011	0.0130	13.7524	0.8098	1.0001	0.0100	0.9318	0.3971	1.0013	0.0134	13.9351	0.8131
Commercial	1.0006	0.0106	5.9833	-0.4991	0.9999	0.0080	9.8505	0.9332	1.0008	0.0109	5.5968	-0.5976
DFCC Bank	1.0008	0.0136	2.8751	0.2710	0.9998	0.0133	0.6312	-0.0570	1.0010	0.0136	3.2135	0.3224
Dialog	1.0006	0.0159	7.9837	-0.0128	0.9980	0.0188	0.8390	-0.1141	1.0010	0.0154	10.2914	0.0603
Distilliers	1.0008	0.0132	3.6349	0.7011	0.9989	0.0165	2.0283	0.3957	1.0011	0.0125	4.0776	0.8436
HNB	1.0006	0.0128	3.3041	-0.0317	1.0001	0.0190	1.1679	-0.3191	1.0007	0.0115	3.3493	0.2088

John Keels	1.0002	0.0128	7.1115	-0.5767	1.0010	0.0138	2.3780	-0.2870	1.0001	0.0126	8.1794	-0.6447
NDB	1.0010	0.0143	6.7718	0.3644	0.9978	0.0154	2.1696	-0.4475	1.0015	0.0140	7.7797	0.5639
Nestle	1.0013	0.0199	12.3293	1.3414	1.0026	0.0290	7.3792	0.8100	1.0012	0.0183	12.7080	1.4867
Sampath Bank	1.0005	0.0119	4.5843	0.4660	0.9981	0.0160	4.0935	0.5101	1.0009	0.0110	4.0012	0.5476
Telecom	1.0002	0.0182	1.7926	0.1715	0.9986	0.0242	0.9739	-0.1326	1.0004	0.0170	1.6264	0.3513
Tobacco	1.0010	0.0192	11.9133	1.1234	1.0027	0.0226	19.9903	3.1005	1.0008	0.0186	8.6475	0.5322

Table 3. Correlation coefficients for the returns of the 16 companies presented in the S&P SL 20 index

	AITKEN	BUKIT	CARGILLS	CARSON	CHEVRON	COMBANK	DFCC	DIALOG	DISTILLIERIES	HNB	TOBACCO	KEELLS	NDB	NESTLE	SAMPATH
BUKIT	0.12053														
CARGILLS	0.21693	-0.03565													
CARSON	0.06485	0.46703	0.18668												
CHEVRON	-0.00329	0.28492	-0.41469	0.14312											
COMBANK	0.23257	0.11807	0.17367	0.05649	0.17514										
DFCC	0.05918	-0.11813	-0.01463	-0.13163	0.01767	0.50162									
DIALOG	0.07418	0.57839	0.07000	0.34626	0.26540	0.22079	0.04295								
DISTILLIERIES	-0.05835	0.50382	0.23979	0.28325	0.32934	0.07671	-0.00774	0.28703							
HNB	-0.08464	0.05880	0.08923	0.14038	0.11828	0.11922	0.12751	-0.03476	0.13461						
TOBACCO	-0.07221	0.10812	0.27280	0.05274	-0.00850	0.22936	0.17363	0.21256	0.24781	-0.01076					
KEELLS	-0.06353	0.25793	0.09775	0.07542	0.32819	0.50786	0.18355	0.38748	0.22144	0.01697	0.28511				
NDB	-0.13456	0.14745	0.01937	0.31690	0.19362	0.49229	0.24327	0.18344	0.19059	0.10749	0.16362	0.59262			
NESTLE	0.00990	0.45589	0.12130	0.67132	0.07693	0.18452	-0.08269	0.40117	0.14520	-0.02928	0.16423	0.22505	0.30535		
SAMPATH	0.16850	-0.11227	0.17285	-0.09719	0.06429	0.33835	-0.01412	-0.03905	-0.01292	0.17840	0.06030	0.31645	0.30671	-0.15467	
TELECOM	-0.03188	0.12539	0.09051	0.23248	-0.05425	0.32056	0.06491	-0.02741	0.08516	0.03118	0.10434	0.11996	0.23712	0.18743	0.11931

Table 4. P-values (<0.01) for the returns of the 16 companies presented in the S&P SL 20 Index

		AITKEN	BUKIT	CARGILLS	CARSON	CHEVRON	COMBANK	DFCC	DIALOG	DISTILLIERIES	HNB	TOBACCO	KEELLS	NDB	NESTLE	SAMPATH
		DH	Oil	BFT	DH	Manu	BFI	BFI	Tele	BFT	BFI	BFT	DH	BFI	BFT	BFI
BUKIT	Oil															
CARGILLS	BFT															
CARSON	DH		0.00238													
CHEVRON	Manu			0.0078												
COMBANK	BFI															
DFCC	BFI						0.0009754									
DIALOG	Tele		9.26E-05													
DISTILLIERIES	BFT		0.000919													
HNB	BFI															
TOBACCO	BFT															
KEELLS	DH						0.0008219		0.0135							
NDB	BFI						0.0012522						5.60E-05			
NESTLE	BFT		0.003113		2.12E-06				0.0103							
SAMPATH	BFI															
TELECOM	Tele															

Table 5. Sector breakdown of the S&P SL 20 Index

Company Name	**Main Sector**
AITKEN SPENCE PLC	Diversified Holdings
BUKIT DARAH PLC	Oil Palms
CARGILLS (CEYLON) PLC	Beverage Food and Tobacco (BFT)
CARSON CUMBERBATCH PLC	Diversified Holdings
CEYLON TOBACCO COMPANY PLC	Beverage Food and Tobacco (BFT)
CHEVRON LUBRICANTS LANKA PLC	Manufacturing
COMMERCIAL BANK OF CEYLON PLC	Bank Finance and Insurance (BFI)
DFCC BANK PLC	Bank Finance and Insurance (BFI)

DIALOG AXIATA PLC	Telecommunications
DISTILLERIES COMPANY OF SRI LANKA PLC	Beverage Food and Tobacco (BFT)
HATTON NATIONAL BANK PLC	Bank Finance and Insurance (BFI)
JOHN KEELLS HOLDINGS PLC	Diversified Holdings
NATIONAL DEVELOPMENT BANK PLC	Bank Finance and Insurance (BFI)
NESTLE LANKA PLC	Beverage Food and Tobacco (BFT)
SAMPATH BANK PLC	Bank Finance and Insurance (BFI)
SRI LANKA TELECOM PLC	Telecommunications

Table 6. Correlation coefficients (p-values <0.01 are highlighted) for the returns for the sectors presented in the S&P SL 20 Index

	DH	BFI	BFT	Oil Palms	Telecommunications
BFI	0.366309				
BFT	0.468065	0.176688			
Oil Palms	0.426317	0.02737	0.442072		
Telecommunications	0.373247	0.251619	0.407854	0.446595	
Manufacturing	0.25686	0.176935	-0.02834	0.284916	0.113172

Table 7. Correlation coefficient r, t-statistic and p-value for the returns of stocks added to the index and not added stocks in the same market segment for the sectors presented in the S&P SL 20 Index

Sector	r	t-statistic	p-value
Diversified Holdings	0.4095	1.9046	0.0360
BFI	0.7026	4.1894	2.4861e-04
BFT	0.8738	7.6227	1.7044e-07
Oil Palms	0.9167	9.7341	4.0551e-09
Telecommunication	0.7818	5.3187	1.9603e-05
Manufacturing	0.4109	1.9122	0.0355

Table 8. Selected 5 companies from CSE from each sector with their market cap (as at 23rd October 2015)

Company	Sector	Market Cap.(as a % of Total Market Cap.)
HEMAS HOLDINGS PLC	Diversified Holdings	1.65
CEYLINCO INSURANCE PLC	BFI	0.95
CEYLON COLD STORES PLC	BFT	1.30
SHALIMAR (MALAY) PLC	Oil Palms	0.55
TEXTURED JERSEY LANKA PLC	Manufacturing	0.76

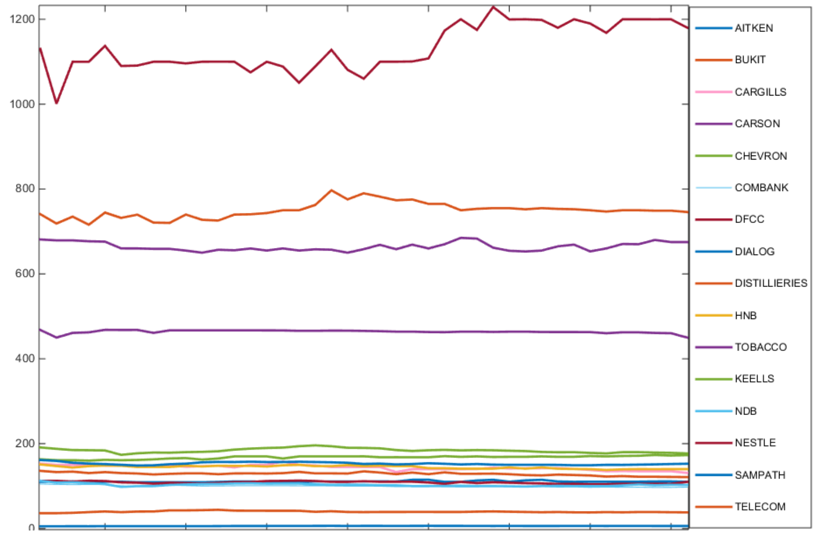

Figure 1. Daily (closing) stock prices of the 16 companies during the event window

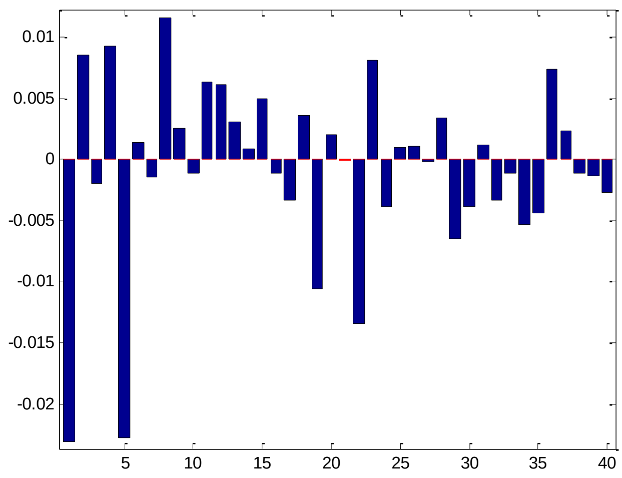

Figure 2. Average daily returns of the 16 companies during the event window

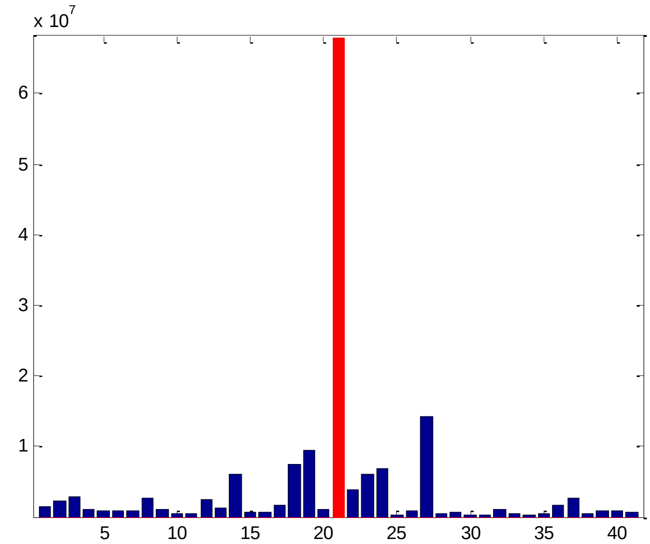

Figure 3. Share volume of the 16 companies during the event window

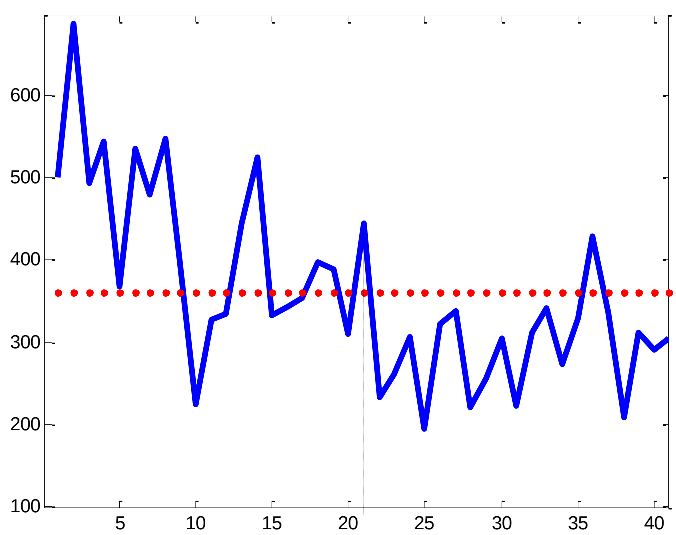

Figure 4. Trade volume of the 16 companies during the event window

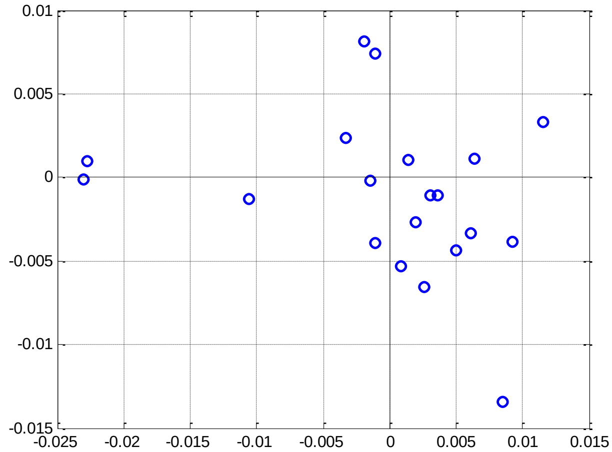

Figure 5. Correlation graph for returns of the added stocks before and after the event

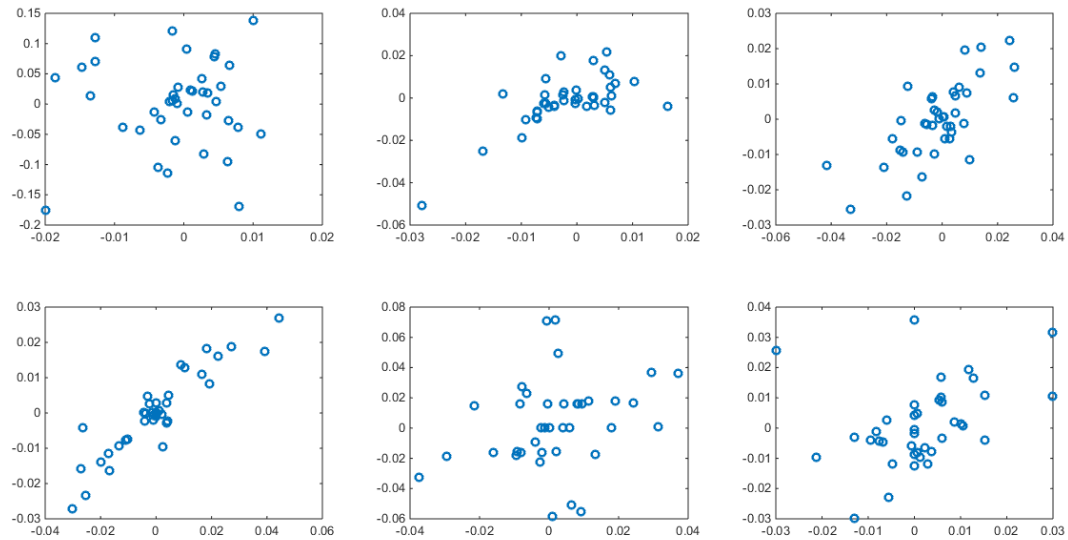

Figure 6. Correlation graphs for the returns of stocks added to the index and not added stocks in the same market segment for the sectors presented in the S&P SL 20 Index

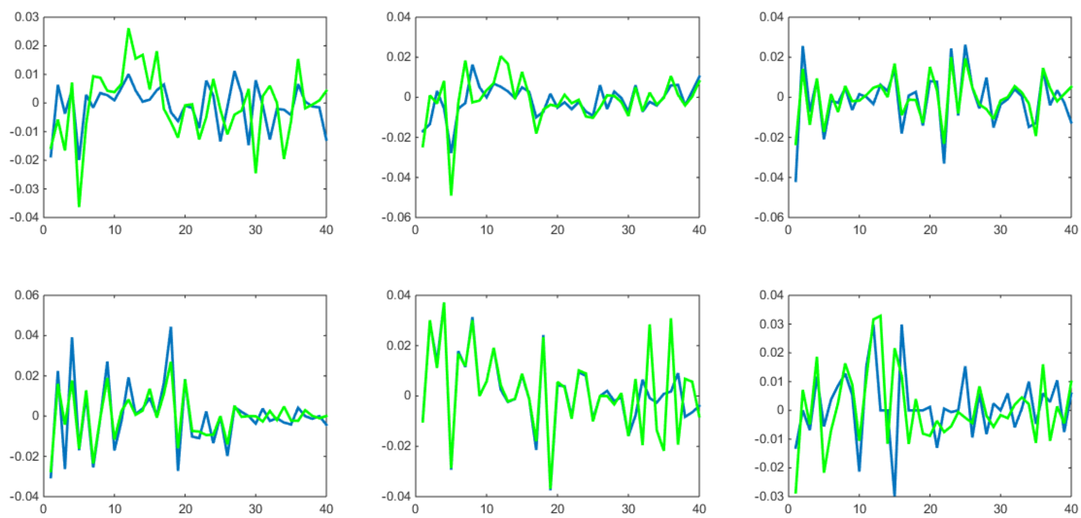

Figure 7. Returns of stocks added to the index and not added stocks in the same market segment for the sectors presented in the S&P SL 20 Index. (blue: stocks in S&P SL 20, green: stocks not in S&P SL 20)

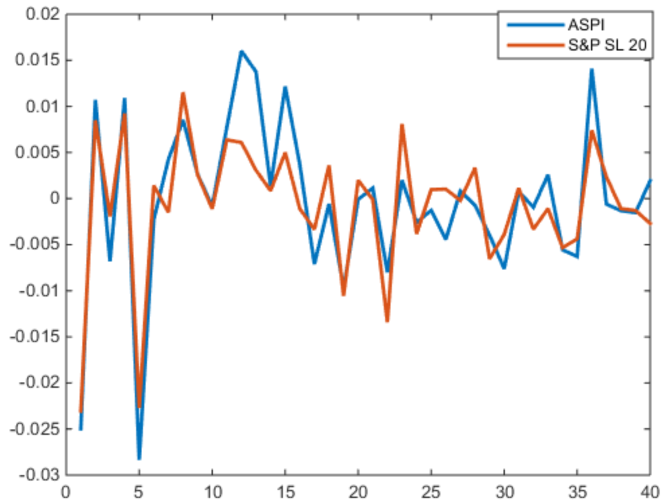

Figure 8. 16 companies' returns and ASPI returns during the event window

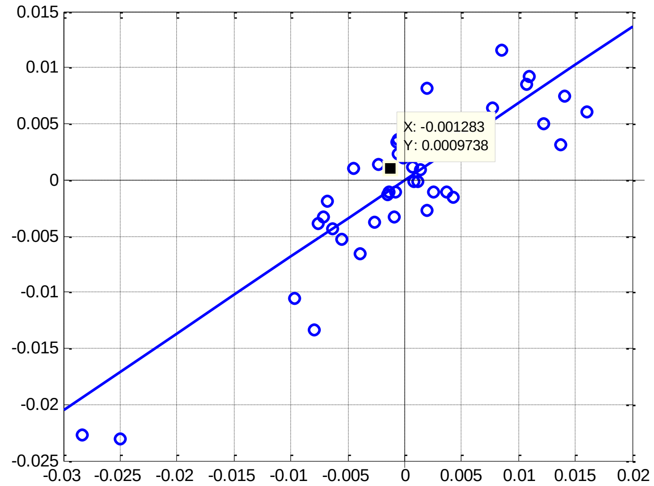

Figure 9. 16 companies returns vs. ASPI returns during the event window. [Square is the data point relevant to event day]

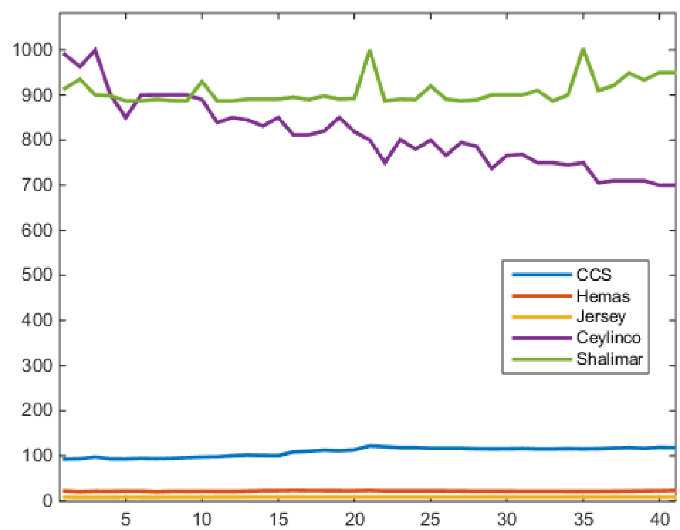

Figure 10. Daily closing stock prices of the selected 5 companies from CSE from each sector during the event window

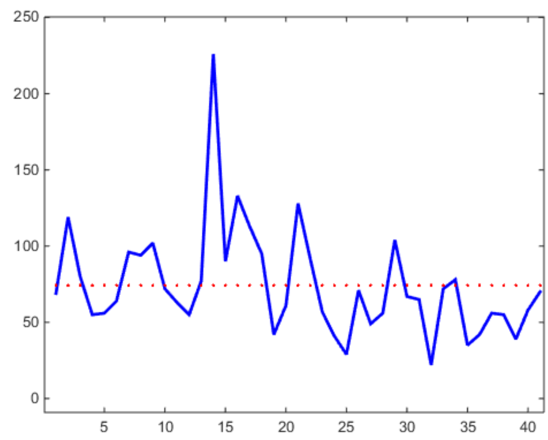

Figure 11. Trade volume of the selected 5 companies from CSE from each sector during the event window

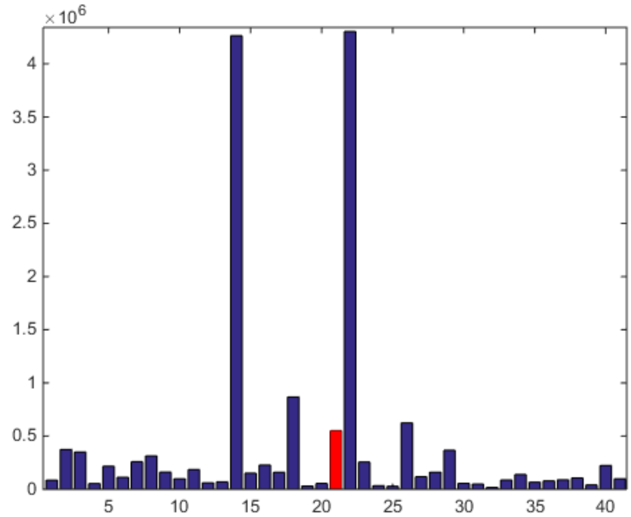

Figure 12. Share volume of the selected 5 companies from CSE from each sector during the event window

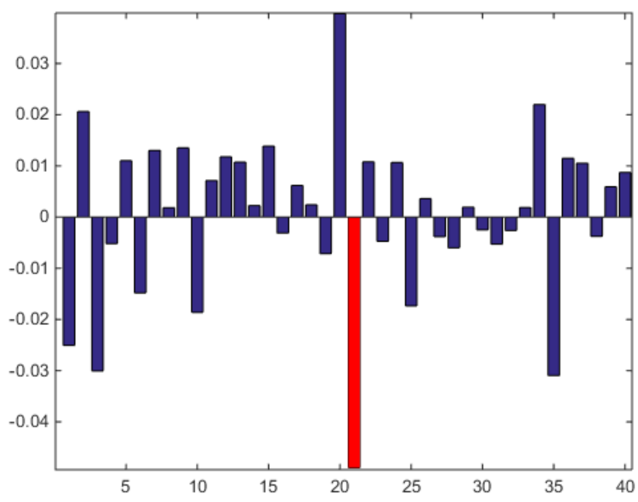

Figure 13. Average daily return of the selected 5 companies from CSE from each sector during the event window

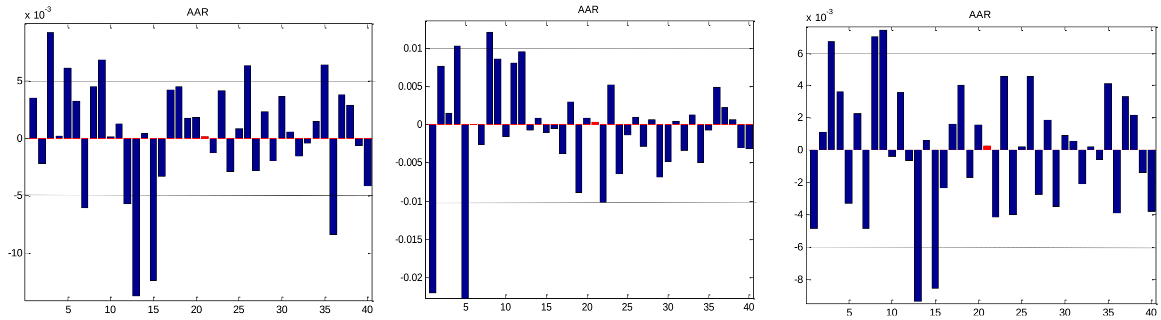

Figure 14. AARs for the average returns of the selected companies from S&P SL20 index for the three market models: M1, M2 and M3. (In red: Event day 21th day.)

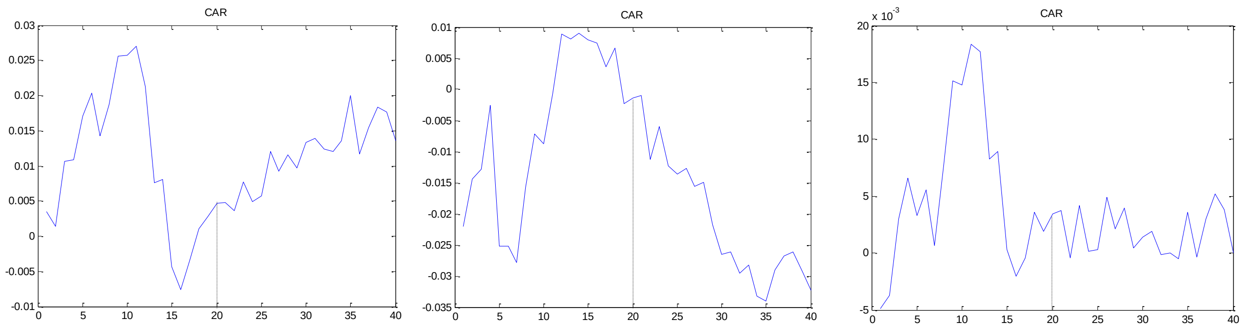

Figure 15. CAARs for the average returns of the selected companies from S&P SL20 index for the three market models: M1, M2 and M3. (Event day is the 20th day.)

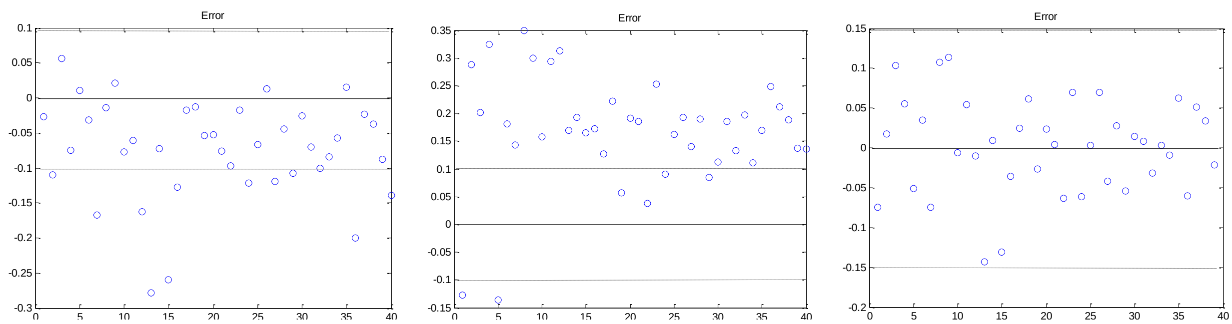

Figure 16. Error graphs for the CAAR for the average returns of the selected companies from S&P SL20 index for the three market models: M1, M2 and M3

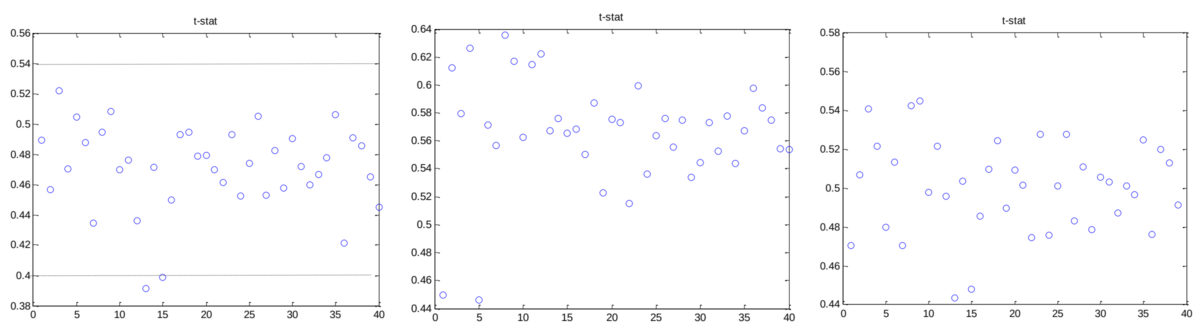

Figure 17. t-statistic for the average returns of the selected companies from S&P SL20 index for the three market models: M1, M2 and M3

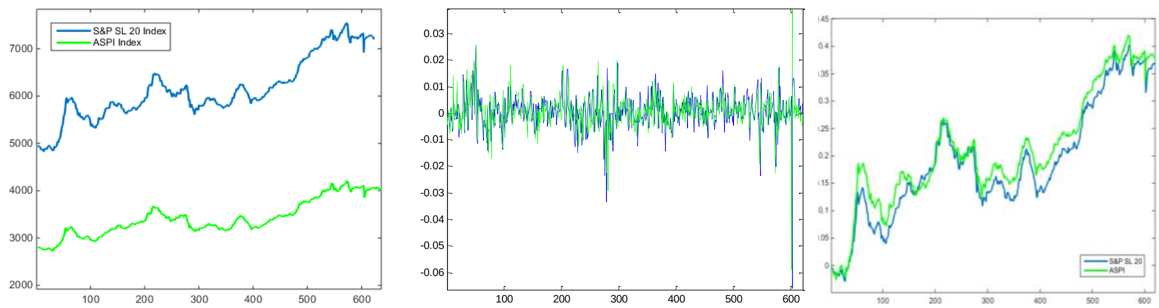

Figure 18. Values, Returns and cumulative log returns for the S&P SL20 index (green) and ASPI index (blue) immediately after the event for 621 trading days

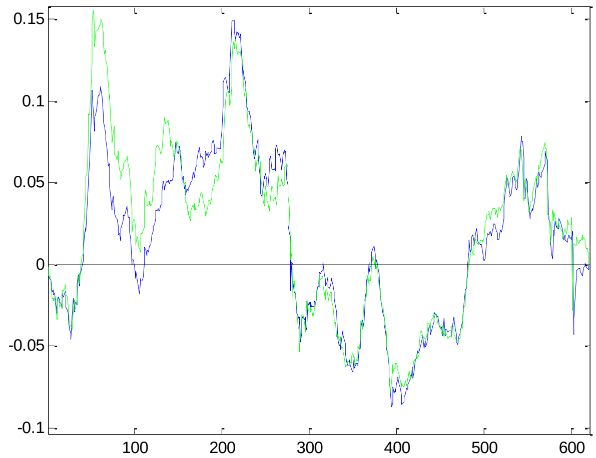

Figure 19. CAAR for the S&P SL20 index (green) and ASPI index (blue) using the market model M3 immediately after the event for 621 trading days

4. Discussion

The following are the important findings of the study:

1) The listed companies in S&P SL 20 index reacted positively (Figure 14: Abnormal Returns) on the day of the launching of the index, 26th of June, 2012. But the reaction is less enthusiastic and after the launch they settled into a negative trend. (Figure 15, Figure 17: Negative Cumulative Abnormal Returns and t-statistic).
2) Share volume and trade volume (Figures 3 and 4, respectively) on the event day is further emphasize the fact that investors were not ready to trust the new index. In fact, they acted negatively to the launching of the index by selling their shares.
3) Also the returns during the event window is not significant as Figure 9 shows their mean values is not significant from zero.
4) Market behavior is reflected in the S&P SL20 Index (Figure 18) and this index has no enhancement over the ASPI.
5) Further there is a change of the price efficiency when the stock is included to the index.
6) Correlation exist between the returns of stocks that are added to the index to some extent, mostly due to being part of the same sector.
7) There is some correlation exist between the stocks that are added to the index in the same market segment.

It is verified from the findings that launching of the S&P SL 20 index has less impact on the listed companies, than expected. The launch itself was not a clear signal to the market regarding the amount and quality of the future analysis and reportage.

Further, in the long run investors acted positively to the launching. In today's information economy, news spreads rapidly and has the potential to have serious consequences in a very short time. But as an emerging market Colombo Stock Exchange and its indices are less prone to act accordingly. The investors' reaction was lukewarm to the startup of the S&P SL 20 index.

We have investigated the impact of the single event, namely: launching of the S&P SL 20 index. However, we have to leave out a huge part of prior data for estimation period due to the huge variance in the data, which we suggest due to the 'post-war boom'. Therefore, that would be an interesting event to study itself.

Also we neglected the yearly listing (delisting) occurs in the S&P SL 20 Index, and one can analyze the impact of that series of events and information content of them in depth, in a future study.

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Notes

Note 1. From each sector, except telecommunications sector. Because there are only two companies belonging to telecommunications sector: Dialog and Telecom - both are present in S&P SL 20.

Note 2. As at of 31, Aug, 2015.

Note 3. According to Island, 2012, S&P SL20 initially represents 54% of the total market.

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Stock Selection Based on Fundamental Analysis Approach by Grey Relational Analysis: A Case of Turkey

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Abstract

Determining financial assets for investment is a significant problem for investors. Especially, since it is riskier in comparison with other financial assets, selecting common stock is not only important for investors but also, it is a complicated decision-making process, because, although they agree to accept a risk, common stock investors tend to keep the risk they undertake at a given level. With this purpose, investors prefer to conduct various analysis and predictions to decide which common stocks they will invest. In this study, by using micro and macro variables, which have been determined with a fundamental analysis approach, a common stock selection is conducted for nine different corporations doing activities in ten lines of business in Borsa Istanbul. In the study, Grey Relational Analysis (GRA), which is developed in the framework of Grey System Theory, is used as a mathematical model. Therefore, a conclusion is obtained about which parameters are more important in selecting a common stock, and the efficiency of GRA Method is tested.

Keywords: stock selection, fundamental analysis, grey relational analysis, beta coefficient, Borsa Istanbul

1. Introduction

There are much multiple-criteria decision making (MCDM) in our daily life (Kou et al., 2008, Huang et al., 2004). Different from single-criteria decision-making problem, MCDM aims to select the best from the existing “alternatives”, “policies”, “actions”, or “candidates”, by considering multiple “attributes,” goals,” or “criteria,” which are frequently in conflict with each other. Therefore, how to make a trade-off between these conflicting attributes and then make a decision could pose a severe problem (Kuo et al., 2008).

In their daily decisions, people implicitly consider the risks they face. In an increasingly complex world, the resulting decisions are not always appropriate because the limits of the human mind do not allow for an implicit consideration of a vast number of different factors. In the past, many lessons had to be learned by trial and error. In a similar manner, a formal analysis may contribute to the decision-making process in complex situations (Bohnenblust & Slovic, 1998).

Many decisions are made under uncertain and/or incomplete information. The analysis of such decision-making is an interesting topic, and many researchers have been engaged with these decision-making problems (Huang et al., 2004).

There are several common methodologies for MCDM are developed such as Analytic Hierarchy Process (AHP), Analytic Network Process (ANP), Data Envelopment Analysis (DEA), Elimination et Choix Traduisant la Realite (ELECTRE), Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE), Simple Additive Weighting (SAW) Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Grey Relational Analysis (GRA), etc.

Stock investment is accepted as a decision-making problem in the science of finance. The critical issue for decision-making in stock trading is a selection of the right stock at the right time. There are many analytical approaches for decision making in a stock exchange, which are categorized in two groups of technical analysis and fundamental analysis (Albadvi et al., 2007).

Technical analysis involves the use of historical market data, such as price, volume, and other observables, to predict future returns on financial assets (Yamamoto, 2012). Fundamental analysis involves audit reports, financial statements, management capabilities and stock's rate of return, beta coefficient and other return and risk parameters (Albadvi et al., 2007, Dhatt et al., 1999, Mukherji et al., 1997, Markowitz, 1952).

In this study, the purpose is to determine macroeconomic and individual micro variables, which can contribute to the decision-making process in a stock selection application within the framework of Grey Relational Analysis Method and basic analysis approach. The reason why such a base has been chosen for the study is that the stock selection process in a portfolio investment plays an important role as much as a determination of stock investment rates to be made since the step of determination of capital allocation rates is the succeeding step after the stock selection process. However, neither Traditional Portfolio Approaches nor Modern Portfolio Theory presents a proactive proposition for the issue of stock selection. Markowitz OV Model, as one of the leading modern approaches, makes a stock selection in the optimization phase. For the previous phases, the only proposition of the Model is selecting stocks from different lines of business. However, it is also possible to select best stocks among the set of assets thanks to a stock analysis to be conducted with mathematical models before the optimization phase. In this way, a more efficient optimization process can be performed. As such, the primary purpose of this study measures the efficiencies of Beta coefficient, the rate of return, standard deviation, and coefficient of variation as the variables of fundamental analysis, which are used in stock selection, through GRA method.

2. Grey Relational Analysis (GRA)

In grey system theory, according to the degree of information, if the system information is fully known, the system is called a white system; if the information is unknown, it is referred to as a black system. A system with information known partially is known as a grey system. The grey system theory includes five major parts: (i) grey prediction, (ii) grey relational analysis (GRA), (iii) grey decision, (iv) grey programming and (v) grey control. GRA is part of Grey System Theory, which is suitable for solving problems with complicated interrelationships between multiple factors and variables (Wei, 2011).

GRA is a tool of grey system theory for analyzing the relationship between a reference series and other series. Grey system theory was developed by Julong Deng in 1982. The GRA is a quantitative analysis to explore the similarity and dissimilarity among factors in developing a dynamic process (Deng, 1989). More clearly, GRA is a method used to determine the relational degree between each factor in a grey system and compared factor series. Every factor is defined as a sequence. The degree of inter-factorial influence is called as a grey relational degree. In other words, GRA aims to measure the similarity between the compared series. The GRA methodology is as follows (Hamzaçebi & Pekkaya, 2011):

Step 1. Define the problem: alternatives $(i = 1,\ldots,m)$, criteria $(j = 1,\ldots,n)$,

$$\chi_i = (\chi_i(1), \chi_i(2), \chi_i(3), \ldots, \chi_i(n)) \tag{1}$$

Step 2. Determine the reference series: reference series may come into existence via the minimum or the maximum – if the criteria require the maximization (minimization) the reference sequence value of the related criteria is the maximum (minimum) value of the alternative series – values of the alternative set or nominal value.

$$\chi_0 = (\chi_0(1), \chi_0(2), \chi_0(3), \ldots, \chi_0(n)) \tag{2}$$

Step 3. Normalization: in order the make the values free of a unit the normalization process is done. This process is called grey relational generating. The normalization process can occur in three types:

i. Higher is better:

$$\chi_i(k) = \frac{\chi_i^0(k) - \min \chi_i^0(k)}{\max \chi_i^0(k) - \min \chi_i^0(k)} \tag{3}$$

ii. Lower is better:

$$\chi_i(k) = \frac{\max \chi_i^0(k) - \chi_i^0(k)}{\max \chi_i^0(k) - \min \chi_i^0(k)} \tag{4}$$

iii. Nominal is better:

$$\chi_i(k) = \frac{\left|\chi_i^0(k) - \chi^0\right|}{\max \chi_i^0(k) - \chi^0} \tag{5}$$

where $\chi_i(k)$ is the value after the normalization, $\chi_i^0(k)$ is the value before the normalization, and $\min \chi_i^0(k)$, $\max \chi_i^0(k)$ are the smallest and largest values of the k^{th} response before the normalization respectively.

Step 4. Calculate the grey relational coefficient: Grey Relational Coefficient (GRC) is an indicator of the similarity between the reference series and alternative series.

$$\varepsilon(\chi_0(k), \chi_i(k)) = \frac{\Delta_{\min} + \xi\Delta_{\max}}{\Delta_{0i}(k) + \xi\Delta_{\max}} \tag{6}$$

Step 5. Calculate the Grey Relational Grade (GRG): GRG is used for overall evaluation of alternatives depending on all criteria. If all criteria have equal importance, the GRG can be calculated by Eq. (9), for different importance degree of the criteria, the GRG can be calculated by Eq. (10). The GRG values are used to rank the alternatives according to the similarity to reference series. The higher GRG value indicates the higher similarity.

$$\gamma(\chi_0, \chi_i) = \frac{1}{n}\sum_{k=1}^{n} \varepsilon(\chi_0(k), \chi_i(k)) \tag{7}$$

$$\gamma(\chi_0, \chi_i) = \sum_{k=1}^{n} w_i(k)\varepsilon(\chi_0(k), \chi_i(k)) \tag{8}$$

It is evident to see that the GRA method is being used in various decision-making processes under the framework of the science of finance when one analyzes the current related literature. The Grey Relational Analysis Method was employed by Fang-Min and by Wang-Ching (2010) and by Ho (2006) in ratio analysis, by Liu et al. (2015) in analysis of house-purchase behaviors, by Huang and Jane (2009) in the determination of investment rates of stocks, by Chen et al. (2014) in forecasting of REIT returns, by Hamzaçebi and Pekkaya (2011) in decision making on stock selection, by Lin and Wu (2011) and by Doğan (2013) in measuring the performances of banks, by Kung and Wen (2007) and by Lee et al. (2012) in measuring company performances, by Wang et al. (2015) in capturing of customer requirements, by Guo et al. (2015) in forecasting of new product diffusion, by Birgun and Gungör (2014) in selection of call center sites, by Pan and Leu (2016) in analysis of bank service satisfaction, by Camelia et al. (2013) in analysis of financial sector in Europe, by Wang et al. (2014) in measuring tourism companies in Taiwan, by Kaygisiz et al. (2015) in evaluation of banks' commercial credit applications, by Sabau-Popa and Bolos (2014) in investigating the effects of macroeconomic variables on Bucharest Stock Exchange, and by Wang et al. (2014) in investment decision making process.

3. Data

In this study, a stock selection process in the Borsa Istanbul is conducted as a decision-making process. The study includes nine different companies conducting activities in ten lines of business. These companies are ALCTL, ANELT, ARENA, ESCOM, INDES, NETAS (Technology – Information Technology), RYSAS (Transportation, Communication and Storage – Transportation – Other Services Related Transport), INTEM (Wholesale and Retail Trade – Wholesale and Retail Trade, Hotels and Restaurants – Lumber and Building Material Wholesale Trade) and SELEC (Textile, Apparel, Furniture Wholesale Trade – Wholesale and Retail Trade, Hotels and Restaurants – Wholesale Trade).

In the developed model, four different independent variables as Beta coefficient (BC), the rate of return (RoR), standard deviation (STD) and coefficient of variation (CV) are used. Independent variables are calculated separately for each of the stocks. The dependent variables are the rates of returns of stocks in the following month.

Why the dependent and independent variables have been determined by the risk - return perspective is the theory itself is based on risk and income (Markowitz, 1952). As such, it is assumed that these parameters are important decision factors in stock selection. Besides, since business line diversification is another constituent of the Modern Portfolio Theory, the assets, which are used in this empirical study, are selected from different industries.

The study covers a period of 13 months from December 2011 to December 2012 as the term of monthly analysis.

In the modeling phase, the time series are established with an assumption that the values of independent variables at the date of $t-1$ will affect the value of the dependent variable at the date of t. Consequently, the values of the period between December 2011 and November 2012 are used for independent variables. Providing a more reliable calculation of these variables, the time of the data is expanded between January 2007 and November 2012. When the values of the period between January 2012 and December 2012 are used as the dependent variable. The data are obtained from DirectFN^{TM}.

Table 1. Results of simulations

SIMULATION – 1

Months	SCC for Modeling	SCC for Test
1	0.0667	0.2500
2	0.3833	0.1500
3	0.2750	-0.2167
4	0.3000	0.1500
5	0.0333	0.6333
6	0.1167	0.3667

Parameters	BC	RoR	STD	CoV
Weights	1	0	0	0

SIMULATION – 2

Months	SCC for Modeling	SCC for Test
1	-0.3000	0.2833
2	0.3167	0.0500
3	0.1083	-0.3833
4	0.3500	0.0667
5	0.0333	0.4500
6	0.2167	0.3333

Parameters	BC	RoR	STD	CoV
Weights	0.6	0	0.35	0.05

SIMULATION – 3

Months	SCC for Modeling	SCC for Test
1	0.0667	0.3667
2	0.4167	0.0667
3	0.1917	-0.2167
4	0.4500	0.1167
5	0.0167	0.5500
6	0.0167	0.1833

Parameters	BC	RoR	STD	CoV
Weights	0.8	0.1	0.1	0

SIMULATION – 4

Months	SCC for Modeling	SCC for Test
1	-0.0833	0.2500
2	0.3333	0.1000
3	0.2250	-0.2833
4	0.4500	0.0667
5	0.0667	0.5000
6	0.1833	0.1833

Parameters	BC	RoR	STD	CoV
Weights	0.75	0.05	0.15	0.05

SIMULATION – 5

Months	SCC for Modeling	SCC for Test
1	0.1500	0.2833
2	0.3833	0.1333
3	0.2250	-0.2167
4	0.3833	0.0667
5	0.0333	0.6333
6	0.0667	0.2833

Parameters	BC	RoR	STD	CoV
Weights	0.95	0.05	0	0

SIMULATION – 6

Months	SCC for Modeling	SCC for Test
1	0.0667	0.3167
2	0.3833	0.1667
3	0.2750	-0.2167
4	0.3667	0.1167
5	0.0167	0.5167
6	0.1833	0.2500

Parameters	BC	RoR	STD	CoV
Weights	0.85	0.05	0.05	0.05

SIMULATION – 7

Months	SCC for Modeling	SCC for Test
1	-0.1667	0.4333
2	0.2667	0.1667
3	0.2583	-0.2167
4	0.4333	0.0667
5	0.0667	0.5000
6	0.1833	0.3333

Parameters	BC	RoR	STD	CoV
Weights	0.8	0	0.1	0.1

SIMULATION – 8

Months	SCC for Modeling	SCC for Test
1	0.0667	0.3167
2	0.3833	0.2333
3	0.2583	-0.2167
4	0.3000	0.1167
5	0.0000	0.5167
6	0.1167	0.2833

Parameters	BC	RoR	STD	CoV
Weights	0.9	0.03	0.02	0.05

4. Results

The data was divided into two parts as modeling and testing. The modeling part was used to determine best weight values of criteria (Beta coefficient "BC," rate of return "RoR," standard deviation "STD," coefficient of variation "CoV") and the testing part was used for to test these weights. The results of simulations as shown in

Table 1.

Spearman Correlation Coefficient (SCC) was used as performance tool while measuring the fitness between the actual and predicted return orders. The Spearman correlation coefficients were given the Table 1, which presented above. These results showed the good fitness between the actual return order and predicted return order by GRA model. These results help to determine the best values of the criteria weights. According to these results most important criteria is the Beta coefficient.

When the results of the simulation are analyzed, it is evident to see that SSC test results obtained with the GRA Method positively increase when weight value given to the Beta coefficient is increased. In other words, the fairest results to the actual ones are obtained by giving weight to the Beta coefficient. For instance, when weight is given to the Beta coefficient by 100% (1.0) in the Simulation-1, the SSC between the actual results and test results increases and when weight is given to the Beta coefficient by 60% (0.6) in the Simulation-2, the SSC decreases. These results indicate that although the independent variable, which has the strongest correlation with the return of the stocks in the following month, is the Beta coefficient among the variables used in this study, this correlation is not so much strong.

When the results are evaluated, in general, it is presented that although there is an explanatory correlation between these four variables and the return of the stocks in the following month; however this correlation is inadequate to make a stock selection.

5. Conclusion

Portfolio optimization operations with the risk – return perspective may produce favorable results have been presented by Harry M. Markowitz initially and other individual scientists. In this study, the efficiencies of these variables in the stock selection phase as the previous stage before optimization are analyzed. However, the results obtained indicate that these variables are not sufficient determiners in the stock selection process as much as they are in the optimization phase.

The results of the study are in parallel with the empirical studies carried by Mukherji et al. (1997) and Dhatt et al. (1999) on Korean stock market. Mukherji et al. (1997) and Dhatt et al. (1999) offer to use rates, which can be calculated with the data from the financial statements of the companies such as especially Market Value / Book Value ratios or Sales/Price ratios and Debt/Equity ratios, in stock selection instead of variables as Beta coefficient.

In this study, variables determined with return – risk perspective is used instead of financial statement ratios. However, it is presented that there is no strong relation between these variables and stocks. By the results of the study, even the Beta coefficient as the variable that has the most substantial relationship is not adequate for decision making. As such, in the following studies, empirical analysis is going to be conducted to measure the effectiveness of financial statement ratios in the stock selection with GRA method and determine whether the related literature applies to the Borsa Istanbul.

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The Effect of Bank Specific Factors on Loan Performance of HFC Bank in Ghana

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Abstract

The default rate of loan in the country has been on the increase and worrying to all in recent times. This study assessed the effect of bank specific factors on the loan performance in HFC Bank in Ghana. The sample period used for the study was based on a quarterly data from 2008 to 2015. The study employed the ARDL bounds test of co-integration as an estimation technique to show the evidence of long run relationship among the variables. The study found bank’s loan interest rate, loan to asset ratio and bank’s loan loss provision over reserve as bank specific factors that influenced loan performance. These therefore showed that bank specific factors do have significant impact on loan performance. Hence, there is the need for bank management and regulators to undertake policies that can ensure efficiency in banks’ operations.

Keywords: loan performance, loan to asset ratio, loan loss provisions, bank’s loan interest rate

1. Introduction

The financial sector plays certain key roles in economic growth by means of financial intermediary service provisions which includes savings mobilization, risk management, projects evaluation and facilitating transactions (Schumpeter, 1934). Channeling of funds from depositors (surplus units) to investors (deficit spending units) is a key role played by commercial banks. This is possible so long as commercial banks can generate enough income to cover operational cost incurred. Thus for sustainable intermediation to function well, there is the need for financial performance (profitable) in the banking industry.

A standardized and widely employed statistic measure of financial performance of a banking institution is the ratio of non-performing loans (NPLs) to total loans. This ratio is often used to evaluate and compare bank loans portfolio quality (Festic, Repina, & Kavkler, 2009; Mendoza & Terrones, 2008), to analyze banking sector’s efficiency (Podpiera, 2006; Lízal & Svejnar, 2002), to foretell forthcoming failures of banks (Jin, Kanagaretnam, & Lobo, 2011).

Keeton and Morris (1987) brought one of the first empirical studies on the subject of non-performing loans (NPLs) examining the causes of loan loss diversity of banks in USA. The study indicated that, part of the changes in loan losses was significantly due to differences in local economic situations and also owing to poor performance in industries such as agriculture and energy, with a minor part of the remaining variation in loan loss associated to bank specific factors, such as banks intentionally embarking on greater risks and granting loans that knowingly have a high default probability. Many studies and findings consider non-performing loans (NPLs) as toxic with injurious effects on both economic development and social welfare (Zeng, 2011; Gonzales-Hermosillo, 1999; Barseghyan, 2010). Banks, according to Khemraj and Pasha (2009), must be circumspect in providing loans and take into consideration several factors in controlling the level of impaired loans.

Amuakwa–Mensah and Boakye–Adjei (2014) in their study found that both bank specific factors (previous year’s NPL, bank size, net interest margin and current year’s loan growth) and macroeconomic factors (past inflation, real GDP, per capita growth and real effective exchange rate) significantly affect non-performing loans of large banks but not necessarily applicable in explaining NPLs for small banks in the banking industry. Individual bank level analysis for Ghana is lacking, in this regard, this study seeks to empirically investigate the determinants of loan performance of HFC Bank considering bank specific factors (internal factors), so as to increase profitability.

2. Overview of Loan Performance in Ghana

In last decade, the banking sector suffered a rugged period in 2013. Regardless of the fact that, in 2013 the industry experienced a growth in total assets by 33 percent as compared to average growth rate of 26 percent over the past decade, the industry suffered a slowdown in deposit mobilization. The banking sector also got plague in that same period in its customer-deposits market, with the most prominent sources coming from government, savings and loans companies, and other finance houses considered as the non-traditional sources. This was evident in banks contending sternly with each other to grow their individual deposits. Another source of the competition in the last ten years can be attributed to the influx of foreign banks in the sub region especially Nigeria as they came in with ground-breaking and innovative ways of banking experienced into the economy (Awuah, 2008; Ghana Banking Survey Report, 2014; Huang et al., 2003).

Yet, there is this striking struggle by banks to attract large number of the unbanked population which is evidently seen by banks spreading out sales personnel to go out in search for prospective customers, opening of more branch networks and the mobile phone banking services. As bank clients grew, so did their respective deposits and hence a growth in the need to grant loans to firms and households who are customers to the bank. For banks to make more profit and out-compete the other, numerous banks granted loans and advances to clients but not all granted loans got re-paid. This has acquainted itself with the incidence of Non-Performing Loans into banks' record books and has gradually fetched a major concern to banks and financial regulators equally (Ghana Banking Survey Report, 2014). High non-performing loans portfolio reduces banks' profits and their capacity to advance lend to debtors and this eventually can adversely affects the economy.

According to the Ghana Banking Survey (2010), the total income of the banking industry got a twice fold amounting GH¢ 1.5 billion in 2009. Nonetheless, the speedy weakening of Ghana's banking industry's loan portfolio adversely struck profit margins. Non-performing loans increased from GH¢ 60 million in 2007 to GH¢ 266 million in 2009. The Central Bank also experienced a worsening non-performing loans ratio of 16 percent in 2009 to 17 percent by the end of 2010. Non-performing loans ratio has caused the top five banks in the country to reduce their market share from 50 percent in 2009 to 45% in 2010 (Bank of Ghana report, 2010).

3. Knowledge of Related Literature

The bank specific factors are variables which affect bank's profitability. These factors are bank specific and include capital size and composition of credit portfolio, interest rate policy, labour productivity, management quality, size of deposit liabilities, and bank size. The CAMEL model is what scholars often employ to proxy bank specific factors (Dang, 2011).

Revenue-Earnings Stream: Here, the main gears of revenues and expenses are examined using the level of operational efficiency and the bank loan interest rate as well as the overall results as measured by return on equity (ROE) and return on assets (ROA).

$$\text{Return on assets (ROA)} = \frac{\text{Net income from operations}}{\text{Average assets}}$$

$$\text{Return on equity (ROE)} = \frac{\text{Net income from operations}}{\text{Average equity}}$$

Management Efficiency: This is a major internal factor that influence banks' profitability and can be proxied by diverse financial ratios such as loan growth rate, earnings growth rate and total asset growth. This is a multifaceted subject to capture using financial ratios. Furthermore, operational efficiency in handling operating expenses is another dimension for management quality. Here management performance is regularly communicated qualitatively through subjective evaluation of management systems, quality of staff, control systems and organizational discipline. The ability of management to use its current resources effectively so as to maximize income as well as reducing operational costs can be used as a measure. The ratio employed to measure management quality is the degree of its inefficiency which is generally expressed as operating expense to income ratio (Ilhomovich, 2009). According to Athanasoglou et al. (2008) as operating expense rises to total income, then management is inefficient in terms of operational efficiency and in its ability to generate income. Management quality in this regard, is measured as;

$$\text{Banks inefficiency (InEff)} = \frac{\text{Operational expenses}}{\text{Operating Income}}$$

It is very necessary to note that not only macroeconomic factors but also bank specific factors do affect NPL. Size of the institution, efficiency and credit terms, market power and the risk profile are essential determinants of NPL since such factors can cause risky loans.

Salas and Saurina (2002) from the case of banks in the Spanish economy stated that Credit growth, capital ratio, bank size, market power and real GDP growth were the explanatory variables in the variations in bad debts. Hu et al. (2004) explained the relationship between the ownership structure and bad loans in banks in Taiwan and concluded that the size of banks was inversely related to non-performing loans. It was also made clear that in a bank where a greater portion of their capital was state owned, there existed a significant reduction in NPLs.

The primary aim of a financial institution is to make profit and its profitability may be used to explain the efforts put in by risk managers in the institution. Weak monitoring as a result of mismanagement for both costs of operation and the quality of loans may induce high level of capital losses. Ineffectiveness on the part of management may have a positive impact on NPL and this was made clearer by Podpiera and Weill (2008) after analysing banking in the Czech Republic. The study reported that there is positive relationship between inefficiencies and future increases in non-performing loans. When managerial performance is being regulated, it will lead to a stable financial system.

When loans are granted to new customers, it may be difficult for managers to assess and control risk associated with such loans. It is very necessary for due diligence to be done before loans are granted to either new and old customers of a bank. Using return on assets, Godlewski (2004) explained that there is an inverse relationship between banks' profitability and NPL. Evidence from Spain according to Garcia-Marco and Robles-Fernandez (2008) also showed that higher levels of return on equity are most likely to be followed with greater risk in the future.

One of the main problems that face financial institutions is the risk that loans may not be paid back. In a situation where banks anticipate capital losses to rise, they may make provisions to reduce the variations in earnings and in effect strengthen their medium term solvency (Pesola, 2007). The attitude of bank towards risk is very important. The financial strength of banks may be indicated by managers with loss provisions. In most cases moral hazard and information asymmetry make granting loans quite risky in the sense that it becomes difficult for managers to decide who is in a good position to pay back a loan. It is a good practice when managers make provision for loan losses. As Boudriga et al. (2009) states it, "a higher provision appears to reduce the level of impaired loans." It was also established that there is a relationship between bank specific factors such as the ratio of total equity assets weighted by risk and non-performing loans. A key bank specific factor that affects non-performing loans is credit growth since various studies have shown that rapid credit growth is often related to bad loans.

4. Methodology

4.1 Model Specification

The study modified Messai and Jouini (2013) model to capture the effect of bank specific factors (internal factors) on loan performance as shown in equation (1).

$$NPL = f(INTR, INEFF, ROA, ROE, LOAS, LLP) \tag{1}$$

This model was further transformed into an econometric model as below;

$$NPL = \alpha_0 + \alpha_1 INTR + \alpha_2 INEFF + \alpha_3 ROA + \alpha_4 ROE + \alpha_5 LOAS + \alpha_6 LLP + v \tag{2}$$

4.2 Data Source

The study used quarterly time series data over the period of 2008 to 2015. Bank specific data such as non – performing loans, bank's loan interest rate, bank's inefficiency ratio, return on assets, and return on equity, loan to asset ratio and banks loan loss provision over reserve were sourced from Bank's records and books.

4.3 Theoretical and a Priori Assumptions

Non-performing loans (NPL) in this study is defined as the total amount of money borrowed and which the borrower is yet to fulfil his or her debt obligations within 90 days. Bank specific factors may affect non-performing loans (NPLs). To find the effects, non-performing loans (NPL) is regressed on some bank specific variables.

Bank's loan interest rate (INTR) is expected to be positive; this is because a rise in the interest rate on loan makes the loan expensive, thus imposing higher risk on borrower's ability to pay the interest due to the reduction in the borrower's ability in meeting his obligations. Similar studies conducted by Jimenez, and Saurina (2005).

Khemraj and Pasha (2009); and Dash and Kabra (2010) have shown a significant positive relationship between non-performing loans (NPL) and bank's interest rate.

Bank's Inefficiency Ratio (INEFF): an increase in INEFF would mean either the operating expense has increased more relatively to income, or income has fallen more relatively to operating expense. A fall in income could be a reflection of loan loss and would lead to more inefficiency on the part of the bank. Thus INEFF is expected to have a positive sign.

Return on Assets (ROA) is expected to be negative. A bank that has greater profitability tends to be lowly motivated in generating income and consequently becomes lowly enticed to engage in risky activities such as granting risky loans.

Return on Equity (ROE) and *Loan to Asset Ratio* (LOAS) are expected to have similar intuitions as ROA.

Bank's loan loss provision/reserve (LLP) has a positive expected sign. Banks that anticipate a higher level of loss may make stringent policies so as to minimise the anticipated loss. Hence providing a low provision amount reflects a low loss and a high loan loss provision reflects a high loss.

4.4 Unit Root Test

In order to avoid the issue of spurious regression results, the study used the Augmented Dickey Fuller test to ascertain stationarity properties of the variables concerned before transforming non-stationary time series to make them stationary for apt economic analysis.

4.5 The Long Run and Short Run Model Specification

A conditional ARDL model of order (p, q1, q2, q3, q4, q5, q6,) was used to test for the long run relationship of the variables identified. The long run ARDL model assumed the form;

$$NPL_t = \beta_0 + \sum_{i=1}^{p} \delta_{1i}\, NPL_{t-i} + \sum_{i=1}^{q1} \delta_{2i}\, INTR_{t-i} + \sum_{i=1}^{q2} \delta_{3i}\, INEFF_{t-i} + \sum_{i=1}^{q3} \delta_{4i}\, ROA_{t-i} + \sum_{i=1}^{q4} \delta_{5i}\, ROE_{t-i} + \sum_{i=1}^{q5} \delta_{6i}\, LOAS_{t-i} + \sum_{i=1}^{q6} \delta_{7i}\, LLP_{t-i} + \varepsilon_t \quad (3)$$

The lag length of the variables is selected based on the Schwarz Bayesian criterion since it gives more parsimonious models specification.

The short run dynamics is captured by the error correction model as follows:

$$\Delta NPL_t = \beta_0 + \sum_{i=1}^{p} \theta_{1i}\, \Delta NPL_{t-i} + \sum_{i=1}^{q1} \theta_{2i}\, \Delta INTR_{t-i} + \sum_{i=1}^{q2} \theta_{3i}\, \Delta INEFF_{t-i} + \sum_{i=1}^{q3} \theta_{4i}\, \Delta ROA_{t-i} + \sum_{i=1}^{q4} \theta_{5i}\, \Delta ROE_{t-i} + \sum_{i=1}^{q5} \theta_{6i}\, \Delta LOAS_{t-i} + \sum_{i=1}^{q6} \theta_{7i}\, \Delta LLP_{t-i} + \varphi ECM_{t-i} + \varepsilon_t \quad (4)$$

Where θ_i is the short-run coefficient of model's dynamic adjustment to equilibrium. ECM_{t-1} term is Error Correction Factor. Thus, it shows the estimate of short run disequilibrium adjustment of long-run equilibrium error term. φ measures speed of adjustment to attain equilibrium in the presence of shocks.

To determine the goodness of fit or robustness of the ARDL model, stability and diagnostic tests were conducted. The cumulative sum of recursive residuals and cumulative sum of squares of recursive residuals were employed for the stability tests whiles serial correlation, normality, functional form and heteroscedasticity were used for the diagnostic test.

5. Empirical Results

5.1 Test for Stationarity

The unit root test was used to test for stationarity of the variables used in the study. The results are shown in Table 1.

Table 1. Unit root test using ADF

Variable	Constant	Constant and trend	Decision
	Levels		
NPL	-3.368840**	-3.422572*	Series is stationary
INTR	-8.350397***	-6.255359***	Series is stationary
INEFF	-5.375751***	-5.748434***	Series is stationary
ROA	-0.002423	-1.505755	Series is not stationary
ROE	-1.509463	-1.828757	Series is not stationary
LOAS	1.939383	-0.217444	Series is not stationary
LLP	-1.835519	-0.612073	Series is not stationary
	First difference		
ROA	-14.89713***	-14.95431***	Series is stationary
ROE	-9.376127***	-3.377720*	Series is stationary
LOAS	-7.618116***	-9.531510***	Series is stationary
LLP	-4.302635***	-4.870515***	Series is stationary

Note. *, ** and *** denotes rejecting the null hypothesis at 10%, 5% and 1% level respectively.

From the ADF test, series such as NPL, INTR and INEFF are all stationary at the levels hence integrated of order zero: I (0), whiles the rest of the series are all stationary after the first difference hence integrated of order one: I (1). Since the series are integrated of orders zero and one. It is therefore appropriate to estimate the model using the ARDL bounds tests specification.

5.2 Test for Co-Integration

The ARDL bounds test procedure was used to determine the presence of long run relationship hence co-integration among the variables in the study. The results are presented in Table 2.

Table 2. Bounds test results for co-integration relationship

F-Statistic	Significance	Lower Bound	Upper Bound	Decision
4.151118	10%	2.12	3.23	Evidence of cointegration
	5%	2.45	3.61	

From Table 2, the F–statistic is greater than the upper bound test. As a result the joint null hypothesis of no co-integration is rejected at 5% level. That is since the F – statistic (4.151118) is greater than the upper bound critical value (3.61) at 5% significant level, there is evidence of co-integration and hence long run relationship among the variables in the study.

5.3 Long-Run Results

Table 3 shows the bank specific factors in the long run on loan performance.

Table 3. Estimated ARDL long run coefficients

Dependent variable: NPL				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTR	1.379911	0.501199	2.753219	0.0123
INEFF	-0.397688	0.258140	-1.540589	0.1391
ROA	-2.036232	5.342503	-0.381138	0.7071
ROE	-0.346651	0.881242	-0.393366	0.6982
LLP	0.024231	0.006751	3.589196	0.0018
LOAS	-13.356108	7.118395	-1.876281	0.0753
C	1.219597	0.221806	5.498496	0.0000

From Table 3, the effect of bank’s loan interest rate on non-performing loans is positive and significant at 5 percent level. This implies that increasing bank’s loan interest rate would significantly worsen loan performance by 1.379911. The result obtained was as expected since a rise in interest rate on loan makes the loan expensive, thus imposing higher risk on borrower's ability to pay the interest. Similar studies by Dash and Kabra (2010) have shown a significant positive association between non-performing loans and bank's interest rate.

On the contrary, bank specific factor such as bank's inefficient ratio negatively affect loan performance. That is, an increase in bank's inefficient ratio would reduce loan performance by 0.397688. This is contrary to expectations since inefficient management rather increases NPL as a result of managers' inability to skillfully assess loans that are granted to new clients. This is however not significant. Hence the finding obtained in this study was consistent with that of Salas and Saurina (2002), but contrary to empirical findings by Berger and DeYoung (1997).

In addition, ROA and ROE inversely affect loan performance. This implies that, increasing ROA and ROE would ameliorate loan performance by 2.036232 and 0.346651 respectively. This is possible because when returns on assets or equity are high banks are slow in granting more risky loans and hence reduce non-performing loan. The results are however not significant. These findings are confirmed in previous studies by Godlewski (2004) who used ROA as a performance indicator and found a negative impact of ROA on NPL. Also, Garcia-Marco, and Robles-Fernandez (2008) posit that higher levels of ROE are followed by a greater risk in the future.

Another significant bank factor that influence loan performance is bank's loan loss provision over reserve. An increase in bank's loan loss provision over reserve would lead to a significant increase in loan performance by 0.024231. Therefore there is a positive relationship between loan performance and bank's loan loss provision over reserve. This is because when banks expect their capital losses to be so high, they strengthen their medium-term solvency and reduce earnings volatility by creating higher provisions. As a result, management indicating the financial strength of their banks can also use loss provisions. Hence loan performance in bank's loan loss provision over reserve can reflect a general attitude by banks' management to control risks. The findings are confirmed by Ahmad et al. (1999), Hasan and Wall (2004), Boudriga et al. (2009); and Pesola (2007).

Finally, the study found the effect of loan to asset ratio on non-performing loans to be negatively significant at 10 percent level such that an increase in loan to asset ratio would worsen loan performance by 13.356108. The result obtained was as expected since loan to asset ratio works as return on assets in generating profits. As a result, greater profitability tend to have less enticements in generating revenue and are not likely to engage in activities that are risky, hence affecting loan performance negatively. Previous studies by Godlewski (2004); Garcia-Marco and Robles-Fernandez (2008); and Boudriga et al. (2009) also confirm the results obtained.

5.4 Short-Run Results

Table 4 depicts the short run effects of bank specific factors on loan performance.

Table 4. Estimated ARDL short run coefficients and the error correction estimate

Dependent Variable: NPL.	Selected Model: ARDL(1, 0, 0, 0, 0, 0, 1)	Obs = 29		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTR)	1.053988	0.352829	2.987246	0.0073
D(INEFF)	-0.303758	0.182554	-1.663930	0.1117
D(ROA)	-1.555293	4.074205	-0.381741	0.7067
D(ROE)	-0.264775	0.665036	-0.398136	0.6947
D(LLP)	0.018508	0.006977	2.652772	0.0153
D(LOAS)	-0.030925	3.298708	-0.009375	0.9926
CointEq(-1)	-0.763809	0.150760	-5.066389	0.0001

All things being equal, the short run results showed that only bank's loan interest rate and loan to asset ratio significantly influence loan performance. The short run effect of bank's loan interest rate on loan performance is positive and significant at 1%. This implies that when bank's loan interest rate increases by a unit, it would worsen loan performance by 1.053988.

Other bank specific factors such as bank's inefficiency ratio, ROA, ROE and loan on asset ratio do not have significant impact on loan performance in the short run. However, the relationships between loan performance and bank's inefficiency ratio, ROA, ROE and loan to asset ratio are all negative in the short run.

Also, there exists a positive and significant impact of bank's loan loss provision over reserve ratio on loan performance at 5 percent level, such that an increase in bank's loan loss provision over reserve would lead to an increase in loan performance by 0.018508.

The error correction term was also negative and statically significant at 1%. A coefficient of -0.763809 implies that the adjustment process of the system would restore equilibrium quickly and effectively, hence it will take about 76% of any shock on the dependent variable caused by the independent variables to be corrected within a year.

6. Conclusion and Policy Recommendations

The default rate of loan in the country has been on the increase and worrying to all in recent times. This study sought to assess the effect of bank specific factors on loan performance of HFC Bank in Ghana using a quarterly data from 2008 to 2015. The Augmented Dickey Fuller (ADF) test was used in testing for the order of stationarity among the variables of which were integrated of orders zero and one. That is, a mixture of I (0) and I (1). As a result, the study employed the ARDL bounds test of co-integration as an estimation technique.

The results suggested that the bank specific factors that influenced loan performance were bank's loan interest rate, loan to asset ratio and bank's loan loss provision over reserve. These therefore show that bank specific factors do have significant impact on loan performance.

Based on the findings, the study recommends that banks should do well to reduce interest rate on loans. Reducing interest rate on loans make loans less expensive; thus reducing the risk on borrower's ability to pay the interest due to an increased ability of borrowers to meet their obligations. This reduces the number of loan default and hence boasts loan performance.

Also, bank managers should also try to anticipate higher level of losses (bank's loan loss provision) by making stringent policies so as to minimise anticipated loss. Thus, the provision of high loan loss provision reflects high losses. As a result bank managers would always try to minimize the expected loss so as to boast loan performance.

Finally, loan to asset ratio should be reduced. Here, banks are advised not to be enticed by the high lending interest rate in the country and the quest for profitability and grant more loans. In granting loans, they should always be cautious of the value of their assets. Reducing ratio of loan to asset would help banks generate greater profitability and enhance loan performance.

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Relationship between Foreign Exchange Rate and Stock Price of Commercial Joint Stock Banks: Evidence from Vietnam

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Abstract

The relationship between foreign exchange rate and stock price is one popular topic that is interested by not only board managers of banks but also stock investors. By using data about foreign exchange rate between Vietnam Dong (VND) and United State Dollar (USD), stock prices data of nine commercial joint stock banks in Vietnam from the first day of 2013 to the last day of 2015, this paper try to answer the question "Does foreign exchange rate impact on stock price and vice verse?". Applying Dickey Fuller test and Var Granger Causality test for the time series data, the results show that there is an impact of foreign exchange rate on stock price. Although the fluctuation in foreign exchange rate VND/USD causes the change in stock prices of commercial joint stock banks in Vietnam, however, the vector of this impact is not clearly. On the opposite way, the change in stock price does not cause the change in foreign exchange rate, this relation is one-way relation.

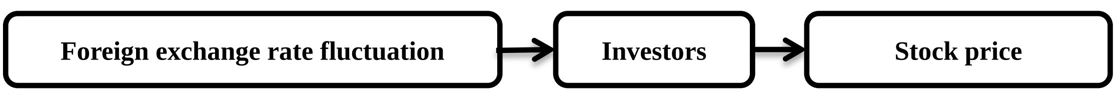
Keywords: causality, foreign exchange market, stock market, VAR granger causality model, volatility spillover

1. Introduction

Commercial joint stock banks have important role in credit market, beside doing business on credit market, some commercial joint stock banks also do business on stock market. Stock price of commercial banks in Vietnam in time period of 2006-2007 was named as the "King stock" by investors. However, after the financial crisis of 2007-08, not only stock markets on the world but also stock market in Vietnam face many risks. Although the business of these commercial joint stock banks still bring good results, their stock prices do not keep credit status like in the past. In order to control stock market in Vietnam, there are many research to find factors that impact stock market, however, almost authors focus on factor consumer price index and factor stock price of the world. For this research, we examine factor foreign exchange rate as one factor that impacts on stock prices of commercial joint stock banks in Vietnam, we also examine the impact of stock prices on foreign exchange rate.

2. Literature Review

According to the theoretical link between foreign exchange rate and stock price, foreign exchange rate has an indirect impact on stock price through an impact on investors.



Investors on stock market in general and investor who invest on stock fund or foreign stock in special, always consider about two problems: Stocks that they own and the price of currency that they use to buy this stock. In case of foreign exchange rate VND/USD, examining investors who own stocks in USD, if the price of USD increases, means foreign exchange rate VND/USD decreases, investors who own stocks in USD will get more benefits, vice verse. Because the returns become larger, these investors will consider about stronger investment on this foreign stock, and the final result of these actions is an appreciation of this foreign stock. By this way, the fluctuation in foreign exchange rate lead to a fluctuation in stock price. (Mougoue, 1996) analyzed this relationship in short-run and long-run, examined in United State and in United Kingdom and the results showed that there are covariance relationship between foreign exchange rate and stock price, means depreciation in currency leads to a decline in stock prices. The research of (Yang, 2000), for some of the Asian countries has the same result. To answer the question: "Stock and Currencies: Are they Related?", the research of (Izan, 1999) found that there is no relationship between foreign exchange rate and stock price in long-run. Inheritting finding from the research of Ong and Izan, examining the relationship between foreign exchange rate and stock price in G-7 countries, (Lee, 2001) found the same result. Analyzing for China, (Zhao, 2010) found bi-directional volatility spillover effects between the Reminbi (RMB) and stock index of Shanghai market, indicating that past conditional variances in stock market have impact on future volatility in foreign exchange rate market, and vice verse.

The relationship between stock price and foreign exchange rate is also stated in many research of (Desislava, 2005), (Tabak, 2006), (Kutty, 2010), (Kurihara, 2006) and (Sekmen, 2011). In Vietnam, there are some studies about this subject such as the research of (Nga, 2013), (Minh, 2015) and (Long, 2010). The subjects of these researches are import- export enterprises. Inheriting results from the research on the world and the research in Vietnam above, we analyze impact of foreign exchange rate fluctuation on stock price in long-run for commercial joint stock banks in Vietnam.

3. Model Specification

We use VAR Granger Causality test to find relationship between foreign exchange rate and stock prices of commercial joint stock banks in Vietnam. This is the main method of this research, and it is applied for analyzing stocks of nine commercial joint stock banks in Vietnam. Beside VAR Granger Causality test, we also use ADF test to be sure that time series data that we use is stationary because stationary is seen as the first requirement of VAR Granger Causality test.

ADF test is fully called "Augmented Dickey-Fuller" test. This test is proposed in the research of two authors named David Dickey and Wayne Fuller (Dickey, 1979) and it is developed by the same authors in 1981 (Dickey, 1981). Later, this test is guided and used popularly in many research when authors want to run regression models as well as Arima or Var models in science research. Some research that used ADF test can be listed as: the research of (Cheung, 1995) and (Xiao, 1998). Specially, ADF is stated in banking with its using in the rearch of Lavan Mahadeva and Paul Robinson (Mahadeva, 2004), the research of (Wickremasinghe, 2004) about foreign exchange markets also used ADF test in the first step for testing stationary for foreign exchange rate variable. Basically, ADF test is easily understood as follow:

Suppose that regression model we build is defined as follow:

$$FOREX_t = \alpha + \beta FOREX_{t-1} + \varepsilon_t \quad (1)$$

Where $FOREX_t$ is variable foreign exchange rate, t is time index, α is coefficient, ε_t is error

In this test we do not care about α, that means α is not specified whether equal 0 or unequal 0.

We also have $\Delta FOREX_t = FOREX_t - FOREX_{t-1}$

(1) Can be written as follow:

$$FOREX_t - FOREX_{t-1} = \alpha + (\beta - 1)FOREX_{t-1} + \varepsilon_t$$

$$\Delta FOREX_t = \alpha + (\beta - 1)FOREX_{t-1} + \varepsilon_t$$

Let 's denote $\delta = \beta - 1$, then we have

$$\Delta FOREX_t = \alpha + \delta FOREX_{t-1} + \varepsilon_t$$

If $\beta = 1 \leftrightarrow \delta = 0 \leftrightarrow \Delta FOREX_t = \alpha + \varepsilon_t$ => $FOREX$ has a unit root or non-stationary. Vice verse, with $\beta < 1$ => $FOREX$ do not have a unit root or $FOREX$ is one stationary time series data.

The problem is how to estimate the value of δ? The answer is δ is estimated by t-statistic. This problem is solved easier in the research of Dickey and Fuller with ADF test. According to this test, if absolute value of t-statistic of Augmented Dickey-Fuller test statistic larger than absolute value t-statistic of test critical value, then we have $FOREX$ has a unit root, vice verse, $FOREX$ is stationary variable.

We do the same method with variable stock prices of nine commercial joint stock banks in Vietnam, means variable FOREX in this model is changed to variable SP_ACB, SP_BID, SP_CTG, SP_EIB, SP_MBB, SP_NVB, SP_SHB, SP_STB, SP_VCB by roster.

With the non-stationary time series data, we can change it into stationary data by a change in level of it (Box, 1965).

3.1 Var Granger Model

Let foreign exchange rate ($FOREX$) and stock price of bank i (SP_i) are stationary time series. To test the null hypothesis that $FOREX$ does not Granger-cause SP_i, one first finds the proper lagged values of SP_i to include in a univariate autoregression of SP_i:

$$SP_{i(t)} = \alpha + \beta_1 SP_{i(t-1)} + \beta_2 SP_{i(t-2)} + \cdots + \beta_n SP_{i(t-n)} + \varepsilon$$

Next, the autoregression is augmented by including lagged values of $FOREX$:

$$SP_{i(t)} = \alpha + \beta_1 SP_{i(t-1)} + \beta_2 SP_{i(t-2)} + \cdots + \beta_n SP_{i(t-n)} + \delta_k FOREX_{t-k} + \cdots + \delta_m FOREX_{t-m} + \varepsilon$$

One retains in this regression all lagged values of $FOREX$ that are individually significant according to their t-statistics, provided that collectively they add explanatory power to the regression according to an F-test. In the notation of the above augmented regression, k is the shortest, and m is the longest, lag length for which the lagged value of $FOREX$ is significant.

The null hypothesis that $FOREX$ does not Granger-cause SP_i is not rejected if and only if no lagged values of $FOREX$ are retained in the regression.

4. Describe Data

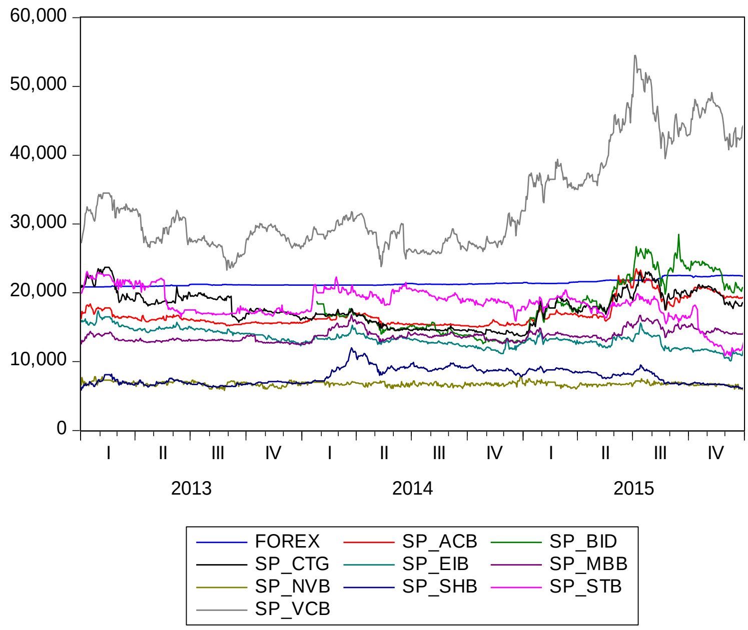
In order to run this model, we use data of foreign exchange rate VND/USD from January, 1st, 2013 to December, 31th, 2015. Until now, Vietnam has 5 stock markets, includes Hose stock market, HNX stock market, Upcom and OTC. Vietnam also has more than 50 commercial joint stock banks. However, there are only 9 commercial joint stock banks who have their stocks are quoted on two stock markets of Vietnam: 3 stocks of 3 commercial joint stock banks quotes on HNX stock market: ACB, NVB, SHB and 6 stocks of 6 commercial joint stock banks quotes on Hose stock market: BID, CTG, EIB, MBB, STB, VCB. The data about stock prices for this research is chosen from these banks in the same time period.

Table 1. List of commercial joint stock banks

	Stock code	Bank's name	Stock market
1	ACB	Asia Commercial Bank	HNX
2	BID	Joint Stock Commercial Bank for Investment and Development of Vietnam	Hose
3	CTG	Viet Nam Joint Stock Commercial Bank for Industry and Trade	Hose
4	EIB	Vietnam Export Import Commercial Joint Stock Bank	Hose
5	MBB	Military Commercial Joint Stock Bank	Hose
6	NVB	National Citizen Commercial Joint Stock Bank	HNX
7	SHB	Sai Gon - Hanoi Commercial Joint Stock Bank	HNX
8	STB	Sai Gon Thuong Tin Commercial Joint Stock Bank	Hose
9	VCB	Joint Stock Commercial Bank for Foreign Trade of Viet Nam	Hose

Time is chosen for research is from December, 31th, 2013 to December, 31th, 2015 as to make the data as up-to-date as possible. Another reason for choosing this period is because the data is available for this time period for all variables under analysis. In particularly, with BID stock, time for research is chosen from January, 24th, 2014 to December, 31th, 2015. It is because of the date that BID started quoting on Hose stock market is January, 24th, 2014.

By graph, we can see that the VCB is the bank that its stock possesses highest price and fluctuates also strongest in this data. Unless NVB, other stocks of other banks also fluctuate strongly, specially in 2015, while the fluctuation of foreign exchange rate seems slowly.



5. Results and Findings

In order to know the relationship between foreign exchange rate and stock price, we use Granger test, and one important requirement of this test is stationary data. Because of this reason, we have to check stationary of time series data by using Dickey-Fuller test first. The result of ADF test is showed through the table below:

Table 2. Result of ADF test

H_0: Variable is stationary.

H_1: Variable is non-stationary.

If $/t_{stat\ (level)}/ > /t_{crit.}$ 5%/ => Accept H_0

If $/t_{stat\ (level)}/ < /t_{crit.}$ 5%/ => Reject H_0 => Change non-stationary data to stationary data by taking the 1st difference (dif). If $/t_{stat(1st\ dif)}$ / > $/t_{crit.}$ 5%/=> Variable is stationary. If not, continue changing by using 2st difference.

	Variable	$t_{crit.}$ 5%	t_{stat} Level	t_{stat} 1st dif	Conclusion
1	FOREX	-2.87	0.54	-26.72	Stationary at lag 1
2	SP_ACB	-2.87	-1.54	-25.10	Stationary at lag 1
3	SP_BID	-2.87	-1.12	-20.12	Stationary at lag 1
4	SP_CTG	-2.87	-2.06	-26.61	Stationary at lag 1
5	SP_EIB	-2.87	-2.36	-18.77	Stationary at lag 1
6	SP_MBB	-2.87	-3.10	-	Stationary at level
7	SP_NVB	-2.87	-7.73	-	Stationary at level
8	SP_SHB	-2.87	-2.05	-28.47	Stationary at lag 1
9	SP_STB	-2.87	-1.55	-27.80	Stationary at lag 1
10	SP_VCB	-2.87	-1.06	-26.97	Stationary at lag 1

Hypotheses of stationary test of time series data is done by ADF test. For this test, we apply 5% significane for all variables. The results of its estimated show that there are 8 in 10 variables are stationary at lag 1, it minuses 2 in 10 variables are not stationary in time period of research. In order to regularize time series data for research, we have to change 8 non-stationary (FOREX, SP_ACB, SP_BID, SP_CTG, SP_EIB, SP_SHB, SP_STB, SP_VCB) to stationary by taking the first difference of its (D(FOREX), D(SP_ACB), D(SP_BID), D(SP_CTG), D(SP_EIB), D(SP_SHB), D(SP_STB), D(SP_VCB)). The results after the first difference give us good data for running regression model, means all variables are stationary in research period.

After having stationary time series data, we can test relationship between foreign exchange rate and stock price of these commercial joint stock banks by using Granger test. And the results show as follow:

Table 3a. Result of Granger test for impact of FOREX on SP

			P-value		Meaning
			Lag 1	Lag 2	
Impact of	FOREX on	SP_ACB	0.0619**	0.0002*	Impact at both lag 1 and 2
		SP_BID	0.0700**	0.0009*	Impact at both lag 1 and 2
		SP_CTG	0.5004*	0.0036*	Impact at both lag 1 and 2
		SP_EIB	0.0135*	0.0209*	Impact at both lag 1 and 2
		SP_MBB	0.1232	0.0020*	Impact at both lag 1 and 2
		SP_NVB	0.0173*	0.1557	Impact at lag 1
		SP_SHB	0.0971**	0.2906	Impact at lag 1
		SP_STB	0.0040*	0.0132*	Impact at both lag 1 and 2
		SP_VCB	0.0714**	0.0137*	Impact at both lag 1 and 2

*Has statistical meaning at 5%; **Has statistical meaning at 10%.

Table 3b. Result of Granger test for impact of SP on FOREX

			P-value		Meaning
			Lag 1	Lag 2	
Impact of	SP_ACB	on FOREX	0.2818	0.3838	Does not impact
	SP_BID		0.3101	0.2613	Does not impact
	SP_CTG		0.1710	0.3147	Does not impact
	SP_EIB		0.9308	0.8050	Does not impact
	SP_MBB		0.5675	0.6474	Does not impact
	SP_NVB		0.9485	0.9591	Does not impact
	SP_SHB		0.7688	0.9524	Does not impact
	SP_STB		0.4730	0.4297	Does not impact
	SP_VCB		0.0996**	0.2331	Impact at lag 1

*Has statistical meaning at 5%; **Has statistical meaning at 10%.

The results of Granger test show that the relationship between foreign exchange rate and stock price is one-way relationship, means only foreign exchange rate impact on stock price, and there is no opposite way of impact. In order to define exactly the relationship between stock price and foreign exchange rate, we use Vector Auto-regression Estimate (VAR method). The result is given as follow:

Table 4a. Result of vector auto-regression estimate for model relation between FOREX and SP_ACB

Variable at lag	Coefficient	Vector
FOREX(-1)	1.040303	Contra-variant
SP_ACB(-1)	-0.002561	
FOREX(-2)	-0.041494	Contra-variant
SP_ACB(-2)	0.003297	

Table 4b. Result of vector auto-regression estimate for model relation between FOREX and SP_BID

Variable at lag	Coefficient	Vector
FOREX(-1)	1.038657	Covariance
SP_BID(-1)	0.003981	
FOREX(-2)	-0.041318	Covariance
SP_BID(-2)	-0.003517	

Table 4c. Result of vector auto-regression Estimate for model relation between FOREX and SP_CTG

Variable at lag	Coefficient	Vector
FOREX(-1)	1.043444	Covariance
SP_CTG(-1)	0.002392	
FOREX(-2)	-0.043208	Covariance
SP_CTG(-2)	-0.001924	

Table 4d. Result of vector auto-regression Estimate for model relation between FOREX and SP_EIB

Variable at lag	Coefficient	Vector
FOREX(-1)	1.042601	Contra-variant
SP_EIB(-1)	-0.002688	
FOREX(-2)	-0.041607	Contra-variant
SP_EIB(-2)	0.002774	

Table 4e. Result of vector auto-regression Estimate for model relation between FOREX and SP_MBB

Variable at lag	Coefficient	Vector
FOREX(-1)	1.041793	Contra-variant
SP_MBB(-1)	-0.002600	
FOREX(-2)	-0.041617	Contra-variant
SP_MBB(-2)	0.003352	

Table 4f. Result of vector auto-regression estimate for model relation between FOREX and SP_NVB

Variable at lag	Coefficient	Vector
FOREX(-1)	1.043189	Covariance
SP_NVB(-1)	0.000956	
FOREX(-2)	-0.042359	Covariance
SP_NVB(-2)	-0.001112	

Table 4g. Result of Granger test for model relation between FOREX and SP_SHB

Variable at lag	Coefficient	Vector
FOREX(-1)	1.043452	Covariance
SP_SHB(-1)	0.000749	
FOREX(-2)	-0.042509	Covariance
SP_SHB(-2)	-0.000532	

Table 4h. Result of vector auto-regression estimate for model relation between FOREX and SP_STB

Variable at lag	Coefficient	Vector
FOREX(-1)	1.039982	Contra-variant
SP_STB(-1)	-0.002365	
FOREX(-2)	-0.037854	Contra-variant
SP_STB(-2)	0.002760	

Table 4i. Result of vector auto-regression estimate for model relation between FOREX and SP_VCB

Variable at lag	Coefficient	Vector
FOREX(-1)	1.041123	Covariance
SP_VCB(-1)	0.000749	
FOREX(-2)	-0.044278	Covariance
SP_VCB(-2)	-0.000428	

When applying model for stock of Asia Commercial Bank, Vietnam Export Import Commercial Joint Stock Bank, Military Commercial Joint Stock Bank and Sai Gon Thuong Tin Commercial Joint Stock Bank, the results show that relationship between foreign exchange rate and stocks prices of these banks are contra-variant, while others are covariance. This means there is no exactly relationship between foreign exchange rate and stock prices of commercial joint stock banks in Vietnam.

6. Conclusion

This research examines the relationship between foreign exchange rate VND/USD and stock prices of nine commercial joint stock banks in Vietnam, the results show that the relationship between them is one-way relationship, that means there is an impact of foreign exchange rate on stock prices, while the change in stock prices do not cause the change in foreign exchange rate. However, the results also show that there is no exactly vector of impact, some are contra-variant, others are covariance. The results of this research can be seen as one evidence for impact of foreign exchange rate on stock price. In order to control stock price, the board managers of the commercial joint stock banks should examine factor foreign exchange rate. Stock investors should also analyze the change in foreign exchange rate when they give buying or selling decision.

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Investigating the Financial Awareness and Behaviors of Veterinary Medical Students

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Abstract

A sample of veterinary medical students were administered a modified version of the Financial Fitness Quiz (FFQ) to gain insights about current veterinary students money management behaviors (e.g., developing financial goals, having a spending plan, accumulating savings, etc.). Results demonstrate students possess a general awareness and conscientiousness toward personal finance. In some cases, veterinary students engaged in positive financial behaviors at a higher rate than average consumers in the United States, and most reported having more cash on hand to cover an emergency than average consumers in the United States. While students generally appear to understand the negative impact of debt, results indicate most students do not fully appreciate the value of personal budgeting or annual calculations of net worth.

Keywords: economics, education, teaching, behavioral finance, finance

1. Introduction

The rising cost of higher education has gained much attention in recent years. According to the U.S. Department of Education (Snyder & Dillow, 2015), the cost of undergraduate tuition, room and board at public institutions rose 39% between 2002-03 and 2012-13. The cost of a post-graduate education has also risen. In the past 15 years, students at the 28 U.S. veterinary colleges have experienced a nearly 250% increase in the mean cost of tuition and fees (American Veterinary Medical Association, 2015). Complicating matters, during the years 2008 to 2012 starting veterinary salaries fell and remain approximately $3,700 off the longer term trend (American Veterinary Medical Association, 2015).

In 2015, the American Veterinary Medical Association's (AVMA) Veterinary Economic Division published a series of economic reports based on data collected from the AVMA's Senior Survey, Employment Survey and Veterinary Compensation Survey. The third report in this series, the 2015 AVMA Report on Veterinary Debt and Income, focused on the challenges faced by new graduates. The report identified two Key Performance Indicators (KPI) for the veterinary profession: Debt-to-Income Ratio (DIR) and Net Present Value of the DVM degree (NPV). DIR is an indicator of the financial health of a veterinarian entering the profession. For 2014, the DIR index value was 2.05, indicating a level of debt slightly greater than two times starting income (American Veterinary Medical Association, 2015). NPV is an indicator of the lifelong value of a veterinary medical degree. It is a measure of the added value of a veterinary degree as compared to what might have been gained from a bachelor's degree alone. For 2014, the average NPV of a veterinary degree for women and men was $71,462 and $41,480, respectively (Knippenberg, 2015).

DIR and NPV are important KPIs as both can be influenced in part by the actions of veterinary students. Specifically both DIR and NPV can be influenced by the training cost incurred by and the financial acumen of veterinary students (American Veterinary Medical Association, 2015). NPV can also be influenced by career path, work/life balance and retirement age chosen by future veterinarians, as well as socioeconomic factors (American Veterinary Medical Association, 2015). However, at present there are extremely little data focused on understanding veterinary students' financial behaviors. Thus, the purpose of this study was to investigate the 'financial fitness' of current veterinary medical students at a large, public university so as to reveal students' awareness and behaviors as it pertains to matters of personal finance.

2. Method

2.1 Course Description

Success in Veterinary Practice is a two week intensive course focused on the non-medical aspects of veterinary medicine. The course explores topics such as starting and building a practice, communicating value, leadership, managing a successful veterinary team, understanding and negotiating employment contracts, personal finance and loan repayment options, practice finance and financial benchmarking. Historically, students self-select to take the course during the fall of either their first, second or third year of veterinary school. However, due to curricular changes, all second and third year students that had not previously taken the course were required to take it in the fall of 2015. Veterinary students enrolled in the school's dual DVM/PhD program were also given the opportunity to enroll in the course.

2.2 Participants

A survey was administered on the first day of class to all 78 students enrolled in the Success in Veterinary Practice course as part of an assignment to discern students' current levels of financial fitness. All 78 students completed the survey, resulting in a 100% response rate. A complete breakdown of student demographic characteristics are presented in Table 1.

Table 1. Demographic characteristics of sample

Variable	No. (%)
Sex	
Male	14 (17.9)
Female	64 (82.1)
Race/Ethnicity	
Black or African American	3 (3.8)
Hispanic or Latino	3 (3.8)
White	65 (83.3)
Other/Not Specified	7 (9.0)
Class	
2017	17 (21.8)
2018	55 (70.5)
Dual degree (DVM/PhD)	6 (7.7)
Age (y)	
Mean (SD)	25.6 (3.0)
Median	25
Range	21-36
Annual Household Income	
Less than $10,000 (1)	37 (47.4)
$10,000-$24,999 (2)	15 (19.2)
$25,000-$49,999 (3)	14 (17.9)
$50,000-$74,999 (4)	8 (10.3)
$75,000-$99,999 (5)	2 (2.6)
$100,000 or more (6)	2 (2.6)

2.3 Instrumentation

Students were administered a modified version of the Financial Fitness Quiz (FFQ) (O'Neill & Xiao, 2003; 2006). The FFQ measures money management behaviors, such as developing financial goals, having a spending plan, accumulating savings, etc. The instrument consisted of 15 items using a five point frequency scale (1=Never; 2=Seldom; 3=Sometimes; 4=Usually; and 5=Always). Three supplemental items with 'yes/no' responses were also included. A listing of items presented to students are available in Tables 2 and 3.

Table 2. Items appearing on the modified financial fitness quiz (frequency scale)

Q1 - I have enough money each month to pay my rent or mortgage payment and other household expenses.
Q2 - I have enough money set aside to pay for an emergency, such as a large car repair.
Q3 - I have enough money set aside to cover at least three months' expenses in the event of a major emergency.
Q4 - I have written financial goals with a date and dollar cost (e.g., $10,000 for a car in 2017).
Q5 - I have a written plan (budget) for spending and/or saving my money.
Q6 -I keep organized financial records (e.g., annual tax returns, bank account statements, credit card statements, etc.) and can find important documents easily.
Q7 - I know my federal marginal tax bracket (e.g., 15%).
Q8 - I calculate my net worth (assets minus debts) annually.
Q9 - I know my student loan debt amount.
Q10 - I save regularly for long-term financial goals, such as education for my children, a house, or retirement.
Q11 - I have adequate insurance to cover "big" unexpected expenses, such as a hospital bills, disability, liability for damages to others and loss of home.
Q12 - Less than 20 percent of my monthly take-home pay goes to my credit cards, student loans, and/or car payments.
Q13 - I pay credit card bills in full to avoid interest charges
Q14 - I comparison shop for major purchases by checking at least three sources.
Q15 - I avoid impulse purchases and don't use shopping as a form of recreation.

Table 3. Supplemental items (yes/no scale)

Q16 - I have a bank checking account (or credit union share draft account) with which to pay bills.
Q17 - I have a personal investment account for retirement (e.g., 401(k), 403(b), IRA) other than a retirement plan by my employer.
Q18 - I have a current will.

2.4 Data Analysis

Because the modified version of the FFQ was used for the first time, and the sample frame differed slightly from typical administrations of the traditional FFQ, it was necessary to subject the instrument to a psychometric validation procedure to evaluate its psychometric properties. The purpose of this preliminary step was essentially to discern the degree to which the findings would be deemed accurate and trustworthy. The primary data analysis for substantive results, however, consisted of traditional statistical procedures (e.g., descriptive statistics, t-tests, etc.).

3. Results

3.1 Validity and Reliability Evidence

The Rasch Rating Scale Model (Andrich, 1978) was utilized to evaluate the psychometric quality of the instrument and its functioning relative to the veterinary student sample frame. Messick's (1989) framework for validity was used to evaluate the psychometric properties of the instrument. Because all 78 students completed the survey, issues of non-response bias were negated. Cronbach's alpha reliability estimates for the 15 items comprising the modified FFQ yielded a value of .735, indicating moderately reproducible measures (Royal & Hecker, 2015). This speaks to the generalizability aspect of validity. A Rasch-based principal components analysis (PCA) of standardized residual correlations indicated 54.8% of the variance was explained by the measures. The largest secondary dimension possessed an eigenvalue of 1.68, indicating the strength of a secondary dimension was about 2 items in magnitude. This lends support to a primary dimension being measured and speaks to the substantive aspect of validity. Infit and outfit mean square fit statistics for each item fell within the recommended range of 0.6-2.0 (Wright & Linacre, 1994). Additionally, point-measure correlations ranged from .30-.66, indicating the items possessed adequate discriminatory capabilities. These pieces of evidence speak to the content aspect of validity. Finally, rating scale category thresholds (-2.04, -.64, .09. .73, and 1.75) advanced in a stepwise manner (Linacre, 2002), thus lending support to the structural aspect of validity.

3.2 Overall Results

Descriptive statistics were produced to indicate the frequency with which students endorsed each item. To aid with reporting and interpretation, the 5-point frequency scale was collapsed into a 3-point scale. Complete results are presented in Table 4.

Table 4. Financial behavior items

Item	Always or Usually	Sometimes	Seldom or Never
	n (%)	n (%)	n (%)
Q1 - Enough rent/bill money	76 (97.44)	0 (0.00)	2 (2.56)
Q2 - Enough money for an emergency (e.g., large car repair)	53 (67.95)	15 (19.23)	10 (12.82)
Q3 - Enough money to cover 3+ months' expenses	36 (46.15)	13 (16.67)	29 (37.18)
Q4 - Written financial goals	7 (8.97)	18 (23.08)	53 (67.95)
Q5 - Written plan (budget) for spending/saving money	28 (35.90)	19 (24.36)	33 (42.31)
Q6 - Organized financial records	50 (64.10)	16 (20.51)	12 (15.38)
Q7 - Know my federal tax bracket	9 (11.54)	11 (14.10)	58 (74.36)
Q8 - Calculate my net worth (assets minus debts) annually	14 (17.95)	7 (8.97)	57 (73.08)
Q9 - Know my student loan debt amount.	70 (89.74)	3 (3.85)	5 (6.41)
Q10 - Save regularly for long-term financial goals	22 (28.21)	21 (26.92)	35 (44.87)
Q11 - Adequate insurance to cover “big" unexpected expenses	63 (80.77)	5 (6.41)	10 (12.82)
Q12 – Less than 20% of monthly pay goes to debts/loans	28 (35.90)	16 (20.51)	36 (46.15)
Q13 - Pay credit card bills in full	64 (82.05)	10 (12.82)	4 (5.13)
Q14 - Comparison shop for major purchases	61 (78.21)	12 (15.38)	5 (6.41)
Q15 - Avoid impulse purchases	54 (69.23)	19 (24.36)	5 (6.41)

Three supplemental items utilizing a ‘yes/no’ format were also included. Students were asked: 1) if they have a bank checking account. Of the 78 students, 76 (97.4%) indicated ‘yes’ and 2 (2.6%) indicated ‘no’; (2) if they have a personal investment account for retirement. Seventeen (21.8%) indicated ‘yes’ and 61 (78.2%) indicated ‘no’; and (3) if they have a current will. Only 5 (6.4%) indicated ‘yes’ and 73 (93.6%) indicated ‘no’.

3.3 Results by Demographic Characteristics

With regard to age, older students, as expected, tend to report higher income levels than younger students (Kendall’s $\tau = .27$, $p = .001$). Class year revealed no discernible differences in household income. Additionally, no discernible differences were observed for financial behavior with regard to race and ethnicity.

A comparison of financial behaviors by sex indicated females (M = 1.69, SD = 1.01) were more likely than males (M = 1.07, SD = 0.27) to “pay credit card bills in full to avoid interest charges”, $t\ (76) = -2.263$, $p < 0.000$). A Cohen’s d effect size (Cohen, 1992) estimate of .83 indicates the magnitude of this difference is “large” in terms of practical significance. A complete breakdown of results by sex are presented in table 5.

Table 5. Financial behavior by sex

Item	Male	Female	*p*
	M (SD)	M (SD)	
Q1 - Enough rent/bill money	1.14 (0.36)	1.39 (0.73)	.070
Q2 - Enough money for an emergency (e.g., large car repair)	1.64 (1.08)	2.28 (1.12)	.056
Q3 - Enough money to cover 3+ months' expenses	2.50 (1.45)	3.06 (1.40)	.181
Q4 - Written financial goals	3.57 (1.34)	4.05 (0.93)	.226
Q5 - Written plan (budget) for spending/saving money	3.57 (1.56)	3.11 (1.26)	.238
Q6 - Organized financial records	2.50 (1.29)	2.30 (1.06)	.535
Q7 - Know my federal tax bracket	3.64 (1.28)	4.30 (1.16)	.065
Q8 - Calculate my net worth (assets minus debts) annually.	3.50 (1.65)	4.30 (1.27)	.108
Q9 - Know my student loan debt amount.	1.50 (1.09)	1.64 (0.90)	.611
Q10 - Save regularly for long-term financial goals	3.43 (1.51)	3.31 (1.37)	.778
Q11 - Adequate insurance to cover “big" unexpected expenses	1.64 (0.84)	1.98 (1.30)	.352
Q12 - < 20% of monthly pay goes to debts/loans	3.43 (1.60)	3.31 (1.39)	.784
Q13 - Pay credit card bills in full	1.07 (0.27)	1.69 (1.01)	.000
Q14 - Comparison shop for major purchases	2.07 (1.14)	1.78 (0.97)	.328
Q15 - Avoid impulse purchases	1.86 (0.86)	2.09 (0.92)	.382

With regard to the supplemental items, 63 of the 64 females (98.4%) reported have a checking account compared to 13 out of 14 males (92.9%). With regard to having a personal investment account for retirement, 15 of 64

(23.4%) females answered ‘yes’ compared to 2 of 14 (14.3%) of males. With regard to having a current will, 4 of 64 (6.3%) females indicated ‘yes’ compared to 1 of 14 (7.1%) males.

4. Discussion

Results of the psychometric validation were evaluated by way of Messick’s framework for validity. Validity evidence was available to support the substantive, content, structural and generalizability aspects of construct validity. Collectively, the psychometric validation process provided a great deal of evidence that the findings from this study are valid and reproducible.

With regard to substantive findings, most students indicated they usually or always: 1) have enough money to pay rent/bills (97.44%), 2) know their student loan debt amount (89.74%), 3) pay their credit card bills in full (82.05), 4) have adequate insurance to cover “big" unexpected expenses (80.77%), and 5) comparison shop for major purchases (78.21%). These findings demonstrate a general awareness and conscientiousness toward personal finance amongst participants. In some cases, students engaged in positive financial behaviors at a higher rate than average consumers in the United States. For example, according to the 2015 Consumer Financial Literacy Survey, only 49% of respondents reported carrying no credit card debit from month to month as compared to 82% of study participants (National Foundation for Credit Counseling, 2015).

Behaviors that most students indicated they rarely, seldom, or only sometimes exhibit include: 1) preparing written financial goals (91.02%), 2) knowing their federal tax bracket (88.46%), 3) calculating their net worth (assets minus debts) annually (82.05%), 4) saving regularly for long-term financial goals (71.79%), 5) having a written plan (budget) for spending/saving money (66.67%), 6) devoting less than 20% of monthly pay to debts/loans (66.67%), and 7) having enough money to cover more than 3 months' expenses (53.84%). In many ways, some of these behaviors are to be expected given these students do not currently have full-time employment, and most never have (based on internal College of Veterinary Medicine data). While the absence of written financial goals and monthly budgeting does not necessarily equate to being fiscally irresponsible, research on budgeting has indicated that one’s beliefs about and management of money can influence spending patterns (Heath & Soll, 1996). Thus, maintaining written financial goals and a monthly budget would be a desirable practice for students.

Interestingly, only 10% of students report seldom or never having enough money to cover an emergency. This is in stark contrast to Bankrate’s Money Pulse poll in 2014 that showed 63% of Americans are not prepared for unexpected expenses and only 38% reported having cash on hand to cover an unexpected emergency room visit or $500 car repair (Holland, 2015). This finding may simply be an artifact of the student body who choose to attend this institution (which is one of the nation’s least expensive veterinary schools), or it could be indicative of how much money veterinary students ensure they have ‘on hand’ during the veterinary school years.

With regard to sex, only one item yielded a statistically significant difference. Females ($M = 1.69$, $SD = 1.01$) indicated they were more likely than males ($M = 1.07$, $SD = 0.27$) to pay credit card bills in full to avoid interest charges ($p < .000$). This in contrast to a 2015 survey conducted by National Debt Relief (NDR) that found that 63% of women ages 18 to 24 had credit card debt compared to just 36% of men (National Debt Relief, 2015). While the age range of consumers in the NDR study was narrower than that of our participants (ages 21-36), our findings may speak to a higher level of awareness as to the consequence of credit card debt.

With regard to one of the supplemental items, 98.4% of females indicated they have a checking account compared to 92.9% of males. On the surface, it appears there may be a meaningful difference given the difference in percentages. However, it should be noted that only one male and one female indicated that they did not have a checking account. Thus, the small sample size for the male student group likely gives the impression of greater behavior discrepancy that truly exists.

Research suggest that learning to better manage one’s finances and improved budgeting can reduce the likelihood of overconsumption and overspending (Lea, Webley, & Walker, 1995) Research also suggest that overconsumption and overspendings can be used as reliable indicators of an individual’s acceptable level of debt (Davies & Lea, 1995; Kidwella & Turrisib, 2004). When these findings are considered together, it suggest that how well individuals manage their finances can impact the amount of debt they accrue. Understanding the current financial behaviors of veterinary students can allow for more targeted intervention with the goal of reducing financial vulnerability. Our findings suggest that students appear to understand the negative impact of debt, as most pay off their credit cards in full each month. However, students do not appear to fully appreciate the value of personal budgeting as most do not engage in monthly budgeting or annual calculations of net worth. Given the evidence of the role budgeting plays in financial health, further investigation into the barriers to budgeting is warranted. Once barrier are identified, we can arrive at a more targeted approach to teaching about financial fitness.

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Dividend Announcement and Ex-Dividend Effects on Stock Return

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Abstract

We study the impact of dividend policy on the stock return by investigating reaction of the stock price on the dividend announcement date and the ex-dividend date. In order to achieve this goal, a sample comprising 1962 observations of dividend-related events from 432 listed companies in Vietnam during the period 2008 to 2015 is chosen to analyze and the event study methodology is used to estimate abnormal returns to the shares around the announcement date and the ex-dividend date. Our results clearly show that the effect of dividend announcement on the stock return is positive around the announcement date. In addition, the stock price moves up as long as the ex-dividend date approaches and then starts decreasing from this date onwards.

Keywords: dividend policy, announcement date, ex-dividend date, stock return, event study

1. Introduction

A dividend policy plays an important role in corporate finance since an optimal dividend policy is the aim of financial management to increase company value. Reaction of stock price to the dividend policy is a debate topic during the last several decades. In terms of the relation between the dividend policy and the firm value, there are two conflicted theories which are dividend irrelevance and dividend relevance. According to the dividend irrelevance theory developed by Miller and Modigliani (1961), there is no relation between the stock value and the dividend policy in the perfect world. However, the bird-in-the-hand theory presented by Linter (1956) and Gordon (1963) argues that shareholders prefer receiving dividend payments rather than uncertain capital gains in the future. The payment of dividend would create the value for the shareholders; therefore the dividend policy affects the firm value. In addition, there have been also several previous empirical researches about the relation between the dividend policy and the stock reactions to be conducted and they showed different results.

Taking account of these contradictions, in this research we analyze the influence of dividend announcement on the stock return of the firms in Vietnam which has not much been considered previously. Based on the investigation of the stock returns subsequent to these announcements, we are able to determine whether the effects of the dividend policy on balance create or reduce the firm value.

2. Literature Review

Dividend policy refers to "the practice that management follows in making dividend payout decisions or, in other words, the size and pattern of cash distributions over time to shareholders" (Lease et al., 2000). Study of the dividend policy has attracted considerable attention of finance scholars since the middle of the last century. They have attempted to explain corporate dividend behavior because the dividend seems to be an enigma in corporate finance. In fact, Black (1976) described it as a "puzzle" and Allen et al. (2000) concluded as "Although a number of theories have been put forward in the literature to explain their pervasive presence, dividends remain one of the thorniest puzzles in corporate finance".

The main contradictory approaches of dividends are summarized in two theories of the dividend policy which are the dividend irrelevance theory and the dividend relevance theory. Moreover, some of other arguments including the information content of dividends (signaling), the clientele effects, and the agency cost hypotheses are also used to explain corporate dividend behavior.

One of the most important theoretical studies about the relation between the dividend policy and the firm value was carried out by Miller and Modigiliani (M&M) in 1961. In this research, they showed that under certain assumptions about perfect capital markets and rational investors, a firm's dividend policy does not affect its value, i.e., the dividend policy would be irrelevant. The value of companies is calculated based on the capitalized value of their future earnings and this is not affected by if the firms pay dividends or not. In other words, the firm value is determined by the income generated from the investment decisions of a firm. M&M (1961) mentioned that the pre-existing dividend clientele effect hypothesis might play a role in the dividend policy under certain conditions. M&M argued that these imperfections might cause investors to choose securities that reduce costs. M&M supposed the tendency of investors to be attracted to a certain type of dividend-paying stocks a "dividend clientele effect".

There are also a few empirical studies, e.g., Black and Scholes (1974), Miller and Scholes (1978, 1982), Chen et al. (2002), Adefila et al. (2004), Uddin and Chowdhurry (2005) supporting for M&M theory. However, the study conducted by Ball et al. (1979), Baker et al. (1985) and Baker and Powel (1999) criticized M&M theory because this theory was proposed under unrealistic assumption.

An alternative view about the effect of the dividend policy on the firm value is that the dividends affect the firm value. The bird-in-the-hand theory of Linter (1956) and Gordon (1959) argued that in a world of uncertainty and imperfect information, dividends are valued differently to retained earnings (or capital gains). Shareholders prefer a higher current dividend payments rather than uncertain capital gains in the future because "a bird in the hand is worth more than two in the bush". Particularly, increasing dividend payments would be associated with increases in firm value. Indeed, a high dividend payout ratio would reduce the cost of capital leading to an increase of the firm value. The empirical studies which support the bird-in-the-hand theory are known as Bhattacharya (1979), Travlos et al. (2001), Baker et al. (2002), Mayers and Frank (2004), Dong et al. (2005) and Maditinos et al. (2007).

The asymmetric information between the managers and the shareholders is also a hypothesis for an inadequate dividend irrelevance hypothesis of M&M. It is likely that the dividends have implicit information about a firm's prospects and convey this information to the market. This proposition has been considered as the "information content of dividends" or the "signaling hypothesis". The announcement of increased dividend is good news leading to higher share prices. On the other hand, the announcement of decreased dividend causes unfavourable prospects which tend to reduce share prices. More details about the dividend signaling models can be found in John and Williams (1985), and Miller and Rock (1985).

Several empirical studies examined the impact of the dividend policy on the share price volatility and exhibited results differently. Friend and Puckett (1964) and Basin (1989) found that there is a positive correlation between dividend and share price volatility. Nevertheless, the results obtained by Fama and French (1988) and Ohlson (1995) showed the negative relation. On the other hand, Allen and Rachim (1996) and Rashid and Rahman (2008) showed that there is no evidence about the impact of dividend yield on price volatility.

Regarding empirical studies about the impact of dividend announcement on the stock price, Scott and Keith (1996) supported the information content of dividend hypothesis by showing a significant impact on abnormal returns of the dividend announcement. Their study indicated that the dividend change announcement conveys information to the market phase. In addition, according to Aharony and Swary (1980), there is a strong impact between quarterly cash dividend and stockholders return since changes of cash dividends provide information about changes of firm's performance in the future. These results were consistent with the information content of dividends hypothesis.

However, Romon (2000) doubted the dividend clientele hypothesis. By examining the stock price reactions at the dividend announcement and that at the ex-dividend date, he found that around the dividend announcement date, the informational effect of dividend announcement depends on the firm dividend policy level. Around the ex-dividend dates, the dividend clientele effect seems to be significantly limited since the market knows the firm dividend policy level.

In 2007, by analyzing the ex-dividend stock price, Dasilas found that significant positive abnormal returns are observed on the ex-dividend date and the stock price on this date does not drop by the full amount of dividend. Moreover, trend of stock return which is positive before the ex-dividend date and negative afterwards supports the short-term trading hypothesis. Recently, Dharmarathne (2013) revealed that the stock price positively reacts to dividend announcements. Particularly, dividend increase announcements support the information content of dividend hypothesis. However, dividend decrease announcements and dividend no change announcements against with the information content of dividend hypothesis. Menike (2014) investigated the stock price reactions to the dividend announcement and he determined information content of dividend announcement. Based on this, the market positively responses to the dividend announcement on the event date.

In Vietnam, a few studies have been also conducted to investigate the impact of dividend policy on stock price.

Vinh (2014) examined the impact of dividend policy which is measured by payout ratio and dividend yield on stock price volatility. By using panel data and regression models to analyze a sample consisting of 103 listed firms in Vietnam from 2008 to 2012, he presented a statistically significant correlation between dividend policy and stock price volatility. After that, Vinh (2015) applied the event study methodology to study the market reaction to cash dividend announcement. This research was conducted based on a sample comprising non-financial companies listed on Vietnamese stock market in the period of 2008-2014 and the results were inconsistent to the semi-strong form of efficient market hypothesis (Fama, 1970). Indeed, he showed that as soon as the information of dividend policy is available to the public market tended to respond slowly in terms of price but quickly in terms of trading volume. More recently, Trung and Dat (2015) also used the traditional event study methodology to investigate the effect of dividend announcement on stock price in Vietnamese stock market. They chose a sample including 979 dividend events of 233 listed companies in the period of 2008-2014 for this research. These authors found that the stock market react positively to share prices and trading volume around the dividend announcement day.

3. Data and Methodology

The aim of the study is to analyse the impact of dividend announcement on the stock return. In order to achieve this goal, the market reaction to the announcements of dividend is carefully investigated.

In this research, the event study methodology, which was developed by Bowman (1983), Brown and Warner (1980, 1985), Fama (1991) and MacKinlay (1997), is applied to measure abnormal returns of the shares around the time that news related to dividend events becomes publicly available. This method allows us to determine the relation between the dividend policy and the stock value. The abnormal returns are estimated over the event windows for each transaction. In the dividend policy study, two important dates consisting of the dividend announcement date and the ex-dividend date are considered. Here, the ex-dividend date is used as an event date because of the difficulty in collecting actual dividend announcement date, i.e., declaration date in Vietnam. Normally, the dividend announcement date is determined between day 8 to day 15 before the ex-dividend date. We have searched and collected data from two websites (www.cophieu68.vn and fpts.com.vn) to determine the ex-dividend date.

A sample including 1962 observations of dividend-related events from 432 listed companies in Vietnam during the period 2008 to 2015 is used for this study. Based on the financial reports of the listed companies in Vietnam stock market, we obtain the daily stock price of target firms to calculate the stock return. The price index (VN-index) is also used to calculate the market return.

The following steps are taken for implementing the event study:

- *Identification of the event window*

We examine different sub event windows [t - 10, t + 10], [t - 3, t + 3], [t - 2, t + 2], [t - 1, t + 1] … over the main period [t - 20, t + 20] with t = 0 representing the time of the event.

- *Determination of a expected return of the security i for time t during the event window in the absence of the event (Kit)*

We use a simple market model to estimate coefficient α and β of firms basing on the return data of 130 dates prior to the event window ($t_{-150,}$, t_{-21}):

$$R_{it} = \alpha_i + \beta_i R_{Mt} + \varepsilon_{it} \quad t \in I_N \tag{1}$$

For each event, the market model is estimated over the period 150 to 21 trading dates prior to the event date.

Then, the expected return K_{it} is estimated for time t during the event window:

$$K_{it} = \alpha_i + \beta_i R_{Mt} \quad t \in I \tag{2}$$

- *Calculation of the abnormal return within the event window*

We calculate the abnormal returns by differencing the observed return R_{it} and the expected return K_{it}: AR

$$AR_{it} = R_{it} - K_{it} \tag{3}$$

- *Calculation of the average abnormal return (AAR) and the cumulative average abnormal return (CAAR)*

Given N events (a total of 1962 in the entire sample), the sample average aggregated abnormal return for period t is:

$$\mathrm{AAR}_t = \frac{1}{N}\sum_{i=1}^{N} \mathrm{AR}_{it} \tag{4}$$

The average abnormal return can then be aggregated over the event window to calculate the cumulative average abnormal return for each firm i:

$$CAAR_{t1,t2} = \sum_{t=t1}^{t2} AAR_t \quad (5)$$

- *Testing whether the abnormal return is statistically different from 0*

We formulate the testable hypothesis: "The average abnormal return is zero".

$$H_0: E(AAR_t) = 0$$

We use Student's t-test to test whether the average abnormal return and the cumulative average abnormal return are statistically different from 0.

$$T = \frac{AAR_t}{\sigma_{AAR_t}} \text{ and } T' = \frac{CAAR_{t1,t2}}{\sigma_{CAAR_{t2}}} \quad (6)$$

where the standard deviation of AAR is determined by Christie (1983) and is given by:

$$\sigma_{AAR_t} = \frac{1}{\sqrt{N}} \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (AR_{it} - AAR_t)^2}$$

$$\sigma_{CAAR_{t2}} = (\sqrt{t2 - t1 + 1})\sigma_{AAR_{t2}} \quad (7)$$

4. Empirical Results

Table below presents the average abnormal returns for the event window (-20, 5).

Table 1. Average abnormal return and the student's t-test

Date	*AAR (%)*	*CAAR (%)*	*t -test AAR*	*Prob.*
-20	0.00018	0.00018	0.2677	0.7889
-19	0.00097	0.00115	1.4153	0.1570
-18	0.00095	0.00125	0.1356	0.8922
-17	0.00028	0.00153	0.3984	0.6903
-16	**0.00138****	**0.00290**	**2.0089**	**0.0453**
-15	0.00091	0.00381	1.3439	0.1790
-14	**0.00144****	**0.00525**	**2.0666**	**0.0388**
-13	0.00112	0.00637	1.5267	0.1268
-12	**0.00249*****	**0.00885**	**3.5481**	**0.0004**
-11	**0.00254*****	**0.01139**	**3.5345**	**0.0004**
-10	**0.00229*****	**0.01367**	**3.1516**	**0.0016**
-9	**0.00274*****	**0.01641**	**2.9579**	**0.0031**
-8	**0.00460*****	**0.02101**	**6.0757**	**0.0000**
-7	**0.00458*****	**0.02559**	**6.3030**	**0.0000**
-6	**0.00579*****	**0.03138**	**7.6532**	**0.0000**
-5	0.00305***	0.03144	4.2314	0.0000
-4	0.00254***	0.03697	3.5214	0.0000
-3	0.00099***	0.03797	1.3811	0.0004
-2	0.00056	0.03853	0.7755	0.1672
-1	**-0.00408*****	**0.03445**	**-5.6583**	**0.0000**
0	**-0.07247*****	**-0.03703**	**-100.53**	**0.0000**
1	-0.00107	-0.03910	-1.4840	0.1378
2	-0.00617***	-0.04526	-8.5520	0.0000
3	-0.00471***	-0.04997	-6.5317	0.0000
4	-0.00168**	-0.05165	-2.3367	0.0195
5	-0.00127	-0.05293	-1.7651	0.7776

***, ** and * represent significance at the 1%, 5% and 10%.

We find that at the particular dates t = -1 and t = 0, the AAR is significantly negative ($AAR_{t=-1}$= - 0.41% and $AAR_{t=0}$= - 7.25%) and the null hypothesis H_0 is rejected at 1% level of significance. This means that at the event date (ex-dividend date), the average abnormal return is strongly negative for the firms whose shares are purchased and the market reacts earlier than the actual announcement of ex-dividend.

During the post announcement period (t = +1 to t = +5), the AAR and the CAAR of these dates are negative. The AAR on the dates 2, 3 and 4 is statistically significant at 1% and 5% levels. However, before the ex-dividend date (t = -20 to t = -2), all the AAR and the CAAR are positive. More specifically, the AAR from the date -12 to the date -2 is statistically significant at 1 percent levels and the AAR on the dates -16 and -14 is statistically significant at 5 percent levels. This indicates that the market reacts around the ex-dividend date as follows: before the ex-dividend date, the stock price increases and decreases afterwards since the ex-dividend date which determines a person to be awarded the dividend is the most important date in dividend investing. Our results are in good agreement with a point of view that a company's share price may go up as the ex dividend date approaches and then go down after the ex dividend date.

The positive AAR over a window period starting from date –20 to date -5 relative to the ex-dividend date (0-date) also implies that the impact of the dividend announcement on the stock return is positive. Normally, the dividend announcement date (declaration date) is determined between day 8 to day 15 before the ex-dividend date. The AAR in this period is positive and statistically significant at 5% or 1% levels. This result shows that the announcement of dividend payment coincides with the remarkable changes of firm values. As seen, the relation between the stocks return and the dividend announcement is also positive and this confirms that the dividend announcement of the listed firms in Vietnam conveys positive information to market participants.

Table 2 reports the cumulative average abnormal returns for different event windows over the period of dividend declaration. Based on this table, the dividend announcement generates remarkably positive CAAR during a few trading dates before and after the announcement of dividend payment. The average cumulative abnormal returns of the subwindows (-20, -1), (-20, -5), (-15, -5) etc. around the dividend announcement date are positive and statistically significant at 1% level. In other words, impact of dividend announcement on the performance of companies is strongly positive around the announcement date. It is useful to recall that according to the dividend signaling theory, a company decides to announce its dividend payout policy to signal its future prospects to the market, leading to a change of its stock prices. Our results show that the market reacts favorably to the announcements of dividend policy of the companies listed on the Vietnamese stock market. This result which is also consistent with the previous studies, e.g., Scott and Keith (1996), Aharony and Swary (1980) and Dharmarathne (2013), supports the information content of dividend hypothesis.

Table 2. Cumulative average abnormal return and the student's t-test around the announcement dividend date

	Event windows	*CAAR (%)*	*t -test - CAAR*	*Prob.*
Main window	(-20,20)	-0.0563***	-12.1872	0.0000
	(-20,-10)	0.0137***	5.7182	0.0000
	(-20,-5)	0.0344***	11.9409	0.0000
	(-20,-1)	0.0349***	10.6846	0.0000
Sub windows	(-15,-5)	0.0315***	13.1876	0.0000
	(-15,-1)	0.0316***	11.2982	0.0000
	(-10,-5)	0.0230***	13.0512	0.0000

***, ** and * represent significance at the 1%, 5% and 10%.

Cumulative average abnormal return for different event windows around the ex-dividend date is also reported in Table 3.

Table 3. Cumulative average abnormal return and the student's t-test around the ex-dividend date

	Event windows	*CAAR (%)*	*t -test - CAAR*	*Prob.*
Main window	(-20,20)***	-0.0563	-12.1872	0.0000
	(-10,10)***	-0.0682	-20.6332	0.0000
	(-5,5)***	-0.0843	-35.2617	0.0000
	(-5,-1)*	0.0031	1.9012	0.0573

Sub windows	(-3,3) ***	-0.0869	-45.5829	0.0000
	(-3,1) ***	-0.0761	-47.1888	0.0000
	(-2,2) ***	-0.0832	-51.6310	0.0000
	(-1,1) ***	-0.0776	-62.1655	0.0000

***, ** and *represent significance at the 1%, 5% and 10%.

The reaction of stock prices on the ex-dividend date is also clearly revealed. The CAAR of all sub windows including the date after the ex-dividend date is negative and statistically significant at the 1%. However, the CAAR for a (-5,-1) window before the ex-dividend date is positive and statistically significant at the 10%. This proves that the dividend payment has a strongly immediate impact on the share price of the Vietnamese stock market. A fall in stock price can be seen from the ex-dividend date onward because the dividend payment possesses a signaling effect. Our results in which the trend of stock return is positive before the ex-dividend date but negative afterwards are in good agreement with the short-term trading hypothesis. This result implies buying pressure on the part of short-term traders in the pre-ex-date period and selling pressure in the post-ex-date period. However, our results are not consistent with some previous studies. Indeed, Romon (2000) doubted about the dividend clientele hypothesis when examining the stock price reactions at the ex-dividend date. This author claimed that the dividend clientele effect seems to be extremely limited because the market knows the firm dividend policy level before the ex-dividend dates. In addition, Dasilas (2007) analyzed the ex-dividend stock price and found that the stock price does not drop on this date. However, based on our result which is shown in Figure 1, a strong decline of the ex-dividend stock price is clearly revealed.

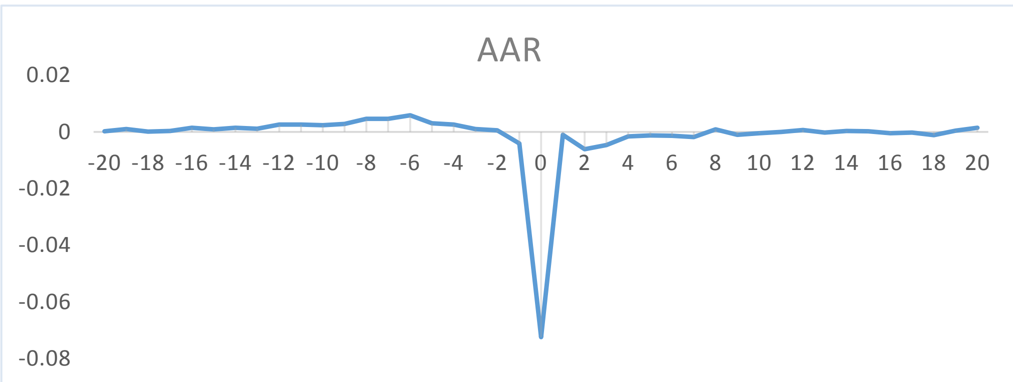

Figure 1. Average abnormal return (%)

Measurement of CAAR over the period (t - 20, t + 20) are shown below.

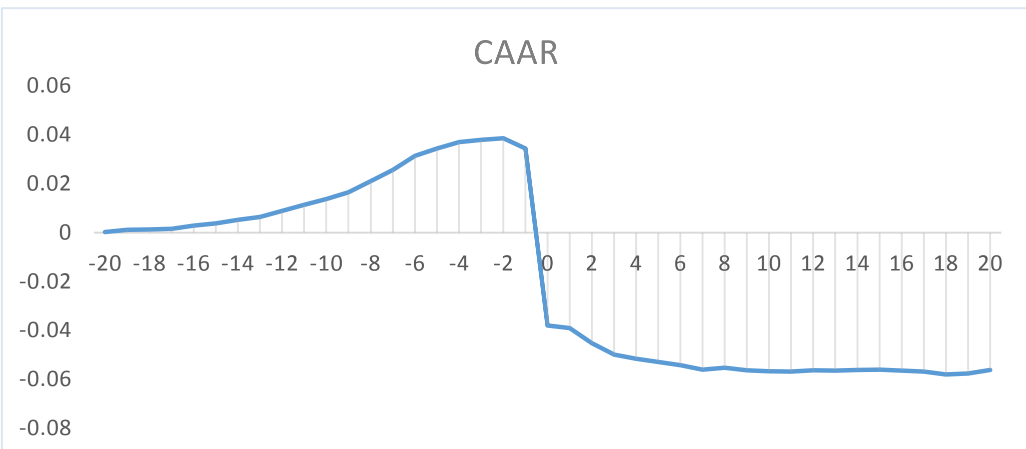

Figure 2. Cumulative average abnormal return (%)

As shown above, CAAR values which are measured before and after the ex-dividend date are completely different. Indeed, CAAR is positive and exhibits a gradually increase from day 20 before the ex-dividend date. On the other hand, from the ex-dividend date onward, CAAR is negative and keeps decreasing. More importantly, CAAR appears to be positive around the dividend announcement date which is normally determined between day 8 to day 15 before the ex-dividend date (t=0). This indicates that the stock price of the firms listed in the Vietnamese stock exchange reacts positively to the dividend announcement.

5. Conclusion

In this research, by examining the stock returns subsequent to the dividend announcements, we have verified whether the dividend policy influences the firm value in the context of Vietnam. It is clear that our results have supported the dividend relevance theory in which the dividend policy affects the firm value. Particularly, the effect of dividend announcement on the stock return of the companies is positive around the announcement date. We have also found that the stock price increases as long as the ex-dividend date approaches but starts decreasing afterwards. Our findings would enhance current understandings of the dividend policy impact on the firm value and that allows financial managers to be able to determine an optimal dividend policy which improve the performance of the firms.

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Are Family Firms Different in Choosing and Adjusting Their Capital Structure? An Empirical Analysis through the Lens of Agency Theory

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Abstract

How do family firms choose and adjust their capital structure? A significant number of contributions have examined the problem from several angles but many issues remain a puzzle. We examine capital structure choices of family firms in Italy, a context characterized by high private benefits of control, separation between ownership and control, and diffusion of family-controlled pyramidal groups. Consistent with the agency-based models, family firms are found to be more leveraged than non-family counterparts as a result of their desire to hold control. We also find higher debt ratios in firms with a higher separation between ownership and control if and only if the firm is controlled by a family. This lends support to the fact that controlling families may want to allocate more debt to subsidiaries, where the separation is higher, in order to inflate assets under domination at the expense of minority shareholders, while controlling negative effects in case of bankruptcy of an affiliate. Finally, family firms are also found to behave differently when they adjust their debt ratio. We show that leverage persistence is higher in family firms because they bear higher adjustment costs as a result of higher agency costs of equity, but lower costs of deviating from the optimal debt level, because the tight links between controlling families and banks may allow family owners to negotiate deviations with banks more easily.

Keywords: expropriation, family ownership, leverage, pyramidal group, speed of adjustment

1. Introduction

Capital structure choice of family firms continues to be an open research question and a fruitful area of enquiry. What do we know about the choice between equity and debt financing of family firms? Two main perspectives can be outlined: on the one hand, family firms may be expected to be less leveraged than non-family firms as a result of the risk aversion of family members that have a large fraction of their financial and human capital tied to the firm. Likewise, family members may be well disposed to maintain low debt levels in order to reduce bankruptcy risks that may jeopardize the purpose to bequeath the firm to heirs (Mishra & McConaughy, 1999). Their supposed long-term orientation (Casson, 1999; Chami, 2001) may therefore explain a lower leverage ratio in family firms than in non-family counterparts. On the other hand, family firms may want to avoid issuing equity so as to minimize the risk of diluting the family's controlling stake. According to the behavioral theory, the desire to hold control would stem from the independence preference of the entrepreneur, especially in small businesses, who does not like the interference of outside shareholders (Hutchinson, 1995; Romano et al., 2001). According to the agency theory, controlling families want to retain control in order to keep gaining private benefits of control, especially when internal and external governance mechanisms are weak (Faccio et al., 2001; Burkart et al., 2003; Anderson & Reeb, 2004; Anderson et al., 2009).

From this perspective, Shleifer and Vishny (1997), La Porta et al. (1999) and Bebchuk et al. (2000) take into account the agency relationship between majority and minority shareholders (hereafter, Type II agency relationship). Controlling families, by making large use of control-enhancing mechanisms such as pyramidal groups, dual-class shares, etc., may separate ownership from control, therefore having the inclination to expropriate wealth from minority shareholders because they only bear a fraction of the total cost of consuming a firm's resources. Recent studies (Filatotchev & Mickiewicz, 2006; Bianco & Nicodano, 2006; Faccio et al., 2007, 2010; Driffield et al., 2007; King & Santor, 2008; Paligorova & Xu, 2012) argue that debt, rather than a tool to constrain manager discretion, is a device used by the largest shareholder to expand resources under control and expropriate minority shareholders and creditors in firms with control rights that deviate from cash flow rights.

However, all these studies seem to ignore the fact that most of the firms that rely on control-enhancing mechanisms are controlled by a family (Morck et al., 2005; Villalonga & Amit, 2009; Bennedsen et al., 2010) and that the higher use of debt in firms with a higher level of separation between voting and cash flow rights may be linked to the family character of the largest shareholder.

The first key contribution of the paper is therefore to examine the debt level as well as the adaptation of debt levels in family firms compared to non-family counterparts, trying to disentangle the effect of family ownership from that of the separation between ownership and control, while revealing potential interactions between the two factors. Based on the agency theory, we analyze capital structure decisions of family firms from the perspective of expropriation risks on a sample of 107 Italian non-financial listed firms over the period 2000-2006. Italy is a suitable environment characterized by high ownership concentration, separation between ownership and control, large incidence of family-controlled pyramidal groups, and high private benefits of control (Aganin & Volpin, 2003; Nenova, 2003; Dyck & Zingales, 2004; Bianchi & Bianco, 2006; Caprio & Croci, 2008; Mengoli et al., 2009).

The second key contribution of the paper is that if Type II agency relationship is poor because of the presence of family ownership, especially when there is a high separation between ownership and control, family firms will face a higher cost of equity. This makes access to public and private equity markets more costly. From a dynamic perspective, and assuming the presence of a target leverage, this implies that family firms' debt ratios will converge on the target at a slower pace than they do in non-family counterparts as a result of higher adjustment costs. This argument may also be observed from the perspective of agency costs of debt (Anderson et al., 2003; Ellul et al., 2007; Steijvers & Voordeckers, 2009). Tight and trust-based relationships between family owners and banks reduce agency costs of debt that, in turn, allow family firms to maintain a leverage ratio far from the target without banks requiring them to reduce its level. Good agency relationships between controlling families and banks make deviations from target leverage more negotiable, with little or no penalty. We argue that Italian family firms face lower agency costs of debt because of the tight links between controlling families and banks (Bianchi et al., 2001; Santella et al., 2007).

We find that family firms are more indebted than non-family counterparts and, more importantly, higher separation between ownership and control does not lead to higher debt ratios unless the firm is controlled by a family. This means that in a context with concentrated ownership structures, separation between ownership and control, and large incidence of family-controlled firms, debt is an instrument used to expand resources under family control and expropriate minority shareholders. We also find that family firms tend to have a far higher leverage persistence as a result of higher adjustment costs and lower costs of deviating from the target leverage.

The remainder of the article is organized as follows: Section 2 provides a review of literature on the use of debt in family firms largely based on the agency theory. In this section we also model our hypotheses; Section 3 describes the econometric approach; Section 4 provides data description; Section 5 shows the main results; Section 6 discusses and concludes.

2. Debt Financing in Family Firms: The Agency Theory Approach and the Italian Case

Shleifer and Vishny (1997), La Porta et al. (1999), and Bebchuk et al. (2000) argue that family firms may face severe Type II agency costs. The interest of minority and majority shareholders may collide to the extent that the amount of wealth invested in the firm by the controlling shareholder, therefore its risk exposure, may be disproportionately lower than its voting power. This condition may result from the use of pyramidal groups, dual-class shares and other instruments designed to separate cash flow rights from voting rights. Why is this problem supposed to be particularly serious in family firms? Several studies document that most family firms are controlled by making large use of control-enhancing mechanisms (Morck et al., 2005; Villalonga & Amit, 2009; Bennedsen et al., 2010). This creates separation between cash flow rights and voting rights and induces the controlling shareholder to extract private benefits that, as such, do not accrue to minority shareholders, while insulating itself from excessive risk exposure and wealth losses should bankruptcy occur. The incentive to expropriate wealth from minority shareholders also resides in the concentrated portfolio exposures that characterize family owners. Rationality implies that such exposures result from the existence of counterbalancing benefits. Private benefits of control may be one such benefit. In consequence, family firms tend to be more prevalent in settings with large private benefits (Bennedsen et al., 2010). Type II agency relationship may also affect agency costs of debt to the extent that non-diverted assets may or may not be sufficient to pay interests and principal amount.

Family firms will therefore be reluctant to issue equity so as to avoid any control dilution problem as well as any interference from outside, minority shareholders. Poutziouris et al. (1998) find that a high proportion (50%) of owners of privately-held firms generally avoid sources of finance that weaken links between ownership and control. Romano et al. (2001) find that family businesses, whose owners have a strong preference for retaining family control, are more likely to derive their funds from bank debt and leasing arrangements. Wiwattanakantang (1999), Harijono et al. (2004), and King and Santor (2008) find that family firms are more leveraged than non-family counterparts because controlling families do not want to risk losing control in order to continue to obtain private benefits of control.

The Italian context is characterized by a large diffusion of family-controlled groups structured as pyramids with several layers, sometimes issuing non-voting shares. Bianchi and Bianco (2006) show that, in Italy, the percentage of listed and non-listed firms with more than 50 employees controlled by a pyramidal scheme was 56.5% in 1993, 44.0% in 2003, and 45.8% in 2005. They also show that the average "leverage", that is, voting rights per unit of capital owned by the largest shareholder, was 4.28 in 1992, 2.22 in 1998, and 2.33 in 2001.

The common use of control-enhancing devices, especially pyramidal groups, is accompanied with a relatively high value of private benefits of control. Nenova (2003) finds that, in Italy, the mean value of control-block votes as a share of firm value was about 30% in 1997; only Mexico showed a higher value (about 36%). Dyck and Zingales (2004) show that the average block premium as percentage of firm value was about 37% for a sample of control-block transactions occurred in Italy during the period 1990-2000; only Brazil, the Czech Republic, and Austria showed higher values. Caprio and Croci (2008) measure the voting premium in Italy from 1974 to 2003 and find that it has decreased over time but remained relatively high: it was 57% in 1990, 65% in 1995, 37% in 2000, and 20% in 2003.

Finally, we may indirectly infer that, in Italy, agency costs of debt may be lower in family-controlled firms than in non-family peers. Bianchi et al. (2001) and Santella et al. (2007), by analyzing the relevance of interlocking directorship in Italian listed firms, show a huge network of director interlocks. This network heavily involves directors of non-financial firms controlled by families that hold seats on the board of directors of banks and other financial institutions, and vice versa. This allows us to argue that family owners tend to be close to their financiers who may therefore monitor family agents better and build enduring and trust-based relationships with them. Lenders should therefore be less concerned of being expropriated by the controlling families, therefore applying improved credit conditions to family-controlled firms.

The picture described above clearly shows how the use of control-enhancing devices, the high private benefits of control as well as the hypothesized lower agency costs of debt should induce family firms to use higher debt ratios in order to allow the controlling family to hold control.

Hypothesis 1: Italian family-controlled firms are expected to be more leveraged than non-family counterparts.

The presence of separation between voting and cash flow rights and related expropriation risks are supposed and found to be linked to debt levels (Bianco & Nicodano, 2006; Faccio et al., 2007, 2010; Driffield et al., 2007; King & Santor, 2008; Paligorova & Xu, 2012). The key argument is that when separation rises, debt may change its role. Instead of being a monitoring device, it may turn to be an instrument used by the controlling shareholder to expropriate wealth from minority shareholders and, ultimately, creditors (Faccio et al., 2007). More specifically, within a pyramidal group, the holding company enjoys the limited liability vis-à-vis the debt obligations of subsidiaries. Consequently, raising external debt from the operating unit gives the controlling shareholder the option of avoiding group bankruptcy by letting the single operating unit go bankrupt, when it is insolvent (Bianco & Nicodano, 2006). This, in turn, implies that subsidiaries, where the ultimate largest shareholder typically holds a very small portion of cash flow rights, may raise a large fraction of group debt since limited liability insures the holding company from costly bankruptcy in adverse contingencies. This mechanism allows the largest shareholder to inflate assets under domination by allocating most of a firm's (risky) projects in the affiliates.

The empirical evidence is largely consistent with this prediction. Faccio et al. (2007) find a positive relationship between separation and leverage in a sample of Asian firms, but not in European firms. They argue that minority shareholders of European firms benefit from more effective capital market institutions that monitor the actions of the controlling shareholder better. This leads to a lower use of debt as expropriation mechanism in European firms. Conversely, Asian firms, that are supposed to have weak capital market institutions, experience a positive relationship between separation and leverage. Paligorova and Xu (2012) show that in developed countries, pyramid-affiliated firms, more exposed to expropriation problems, exploit debt to a greater extent. The inclination to use more debt persists but is significantly lower in countries with better creditor protection. According to Paligorova and Xu (2012), Faccio et al. (2010) show that leverage is significantly higher in corporations with a higher separation between voting and cash flow rights and in those headquartered where creditor protection is weaker. Driffield et al. (2007) and King and Santor (2008) seem to find results consistent to the above studies.

Assuming that family owners may be more disposed to use control-enhancing devices to acquire private benefits and expropriate minority shareholders, they are more likely to exploit debt financing to a greater extent in firms characterized by a larger deviation between cash flow rights and voting rights in order to expand resources under control to the detriment of minority shareholders, without bearing significant consequences in case of bankruptcy.

Hypothesis 2: The family character of the dominant owner positively moderates the relationship between separation and leverage ratio.

Family ownership may affect not only the debt ratios in a static context, but also the adaptation of debt levels in a dynamic perspective. The starting point consists in assuming the existence of a target leverage, that is, a hypothesized optimal level, dependent on firm-specific, industry-specific, and market-wide characteristics, which may vary over time, toward which a firm's leverage ratio may converge, in order to optimize the capital structure from the perspective of maximizing firm value (Flannery & Rangan, 2006). We argue that family ownership may affect the speed at which a firm rebalances its leverage ratio towards the target as a result of its influence on agency costs. First, higher Type II agency costs in family firms make access to equity financing more difficult and costly. Family firms will therefore be less induced to issue equity. Second, issuing equity may threaten family control; family owners should therefore prefer debt in place of equity. Third, in Italy, families that control non-financial listed firms seem to have close ties to the banking system mainly through interlocking directorship (Bianchi et al., 2001; Santella et al., 2007) and personal connections. The tight links between family owners and banks give the lender superior monitoring abilities as well as the possibility to establish with the firm long-lasting and trust-based relationships that reduce agency costs of debt. From the demand side, we expect this characteristic to lower the cost of debt for family firms which will therefore find it relatively more convenient. From the supply side, this significantly reduces expropriation risks at the expense of creditors that, in turn, will be more disposed to offer credit to family firms on better conditions and negotiate suboptimal capital structures with controlling families without forcing the firm to bear punishment. The above discussion has two key implications. First, the adjustment costs should be higher in family firms. In fact, poor Type II agency relationships make access to public capital markets more difficult and costly, therefore reducing the range of opportunities to adjust the capital structure towards the target. Second, the costs of deviating from the target leverage should be lower in family firms. In fact, strict relationships between banks and controlling families make deviations from the optimal leverage ratio more negotiable.

Hypothesis 3: Family firms are supposed to have a lower speed of adjustment towards the target leverage than that of non-family counterparts.

3. Econometric Specification

The general formulation of the model to test capital structure determinants can be written as follows:

$$y_{i,t}^{*} = a + \mathbf{bX_{i,t}} + \varepsilon_{i,t} \tag{1}$$

Where i refers to firm, t is the time, $y_{i,t}^{*}$ is the value of our leverage measures for the $i-th$ firm at time t, a is the constant of the model, $\mathbf{X_{i,t}}$ is $(k \times 1)$ vector of the independent variables for the $i-th$ firm at time t, b is the $(1 \times k)$ vector of the unknown parameters, and $\varepsilon_{i,t}$ is the innovation. Equation (1) is estimated by a fixed effects model.

In order to assess the speed of adjustment, we consider the partial adjustment model which explains the change of firm leverage between two successive periods as a linear function of the difference between the target leverage and the leverage observed in a previous period. The adjustment equation is:

$$y_{i,t} - y_{i,t-1} = (1-\lambda)(y_{i,t}^{*} - y_{i,t-1}) \tag{2}$$

Where λ is the unknown parameter which indicates the speed of adjustment, $y^*_{i,t}$ is the target leverage estimated by Equation (1), $y_{i,t}$ and $y_{i,t-1}$ are the values of our leverage measures, respectively, at time t and $t-1$.

The more the λ value is close to 0, the less the firm takes time to converge on the target; the more the λ value is close to 1, the more the firm takes time to converge on the target.

The speed of adjustment is estimated through a one-step procedure. Without explicitly estimating the target leverage by Equation (1), we rearrange Equation (2) for $y_{i,t}$ and insert Equation (1) for $y^*_{i,t}$, then we obtain:

$$y_{i,t} = a(1-\lambda) + \mathbf{b}(1-\lambda)\mathbf{X_{i,t}} + \lambda y_{i,t-1} + (1-\lambda)\varepsilon_{i,t} \tag{3}$$

λ is estimated by using two alternative specifications. The first one relies on the so-called GMM-SYS estimator proposed by Blundell and Bond (1998). This estimator is based on first differencing transformation to eliminate an unobserved firm-specific effect. It uses lagged values of endogenous or predetermined variables as instruments for first differences. GMM-SYS estimator is preferred among first-differenced instrumental estimators and GMM estimators for short sample periods and persistent data series such as ours. Lemmon et al. (2008) demonstrate that corporate leverage is highly persistent over time.

GMM-SYS estimator takes the first difference of Equation (3) as follows:

$$y_{i,t} - y_{i,t-1} = \mathrm{b}(1-\lambda)\,(\mathrm{X_{i,t}} - \mathrm{X_{i,t-1}}) + \lambda(y_{i,t-1} - y_{i,t-2}) + (1-\lambda)\,(\varepsilon_{i,t} - \varepsilon_{i,t-1}) \tag{4}$$

Equations (3) and (4) are then simultaneously estimated. GMM-SYS estimator uses lagged differences as instruments for Equation (3) and lagged levels as instruments for Equation (4).

The second approach relies on the long difference (LD) instrumental variables estimator proposed by Hahn et al. (2007) and, to the best of our knowledge, applied in a context of dynamic capital structure only by Huang and Ritter (2009), Drobetz and Schilling (2012), and Flannery and Hankins (2013). Hahn et al. (2007) demonstrate that GMM estimators have substantial bias for a large positive λ, which commonly occurs in the estimation of the speed of adjustment. Their approach is an instrumental variable estimator that uses a reduced set of instruments, in particular "long differences". This estimator also leads to a significant reduction in bias resulting from the problem of weak instruments.

The LD estimator is based on the following equation:

$$y_{i,t} - y_{i,t-k} = \mathbf{b}(1-\lambda)(\mathbf{X_{i,t}} - \mathbf{X_{i,t-k}}) + \lambda(y_{i,t-1} - y_{i,t-k-1}) + (1-\lambda)(\varepsilon_{i,t} - \varepsilon_{i,t-k}) \tag{5}$$

Where k is the number of periods that define the differencing length.

Observation $y_{i,t-k-1}$ would serve as a valid instrument to estimate Equation (5) by means of two-stage least squares (2SLS). After having found the initial values of λ and $\mathbf{b}(1-\lambda)$, we can further increase the explanatory power of the instruments by observing that the residuals $y_{i,t-1} - \lambda y_{i,t-2} - \mathbf{b}(1-\lambda)\mathbf{X_{i,t-1}}$, $y_{i,t-k+1} - \lambda y_{i,t-k} - \mathbf{b}(1-\lambda)\mathbf{X_{i,t-k+1}}$ are also valid instruments. Then we use $y_{i,t-k-1}$ and the residuals as instruments to estimate Equation (5) through 2SLS. This procedure is then further iterated. According to Hahn et al. (2007), three iterations are usually sufficient to obtain reliable estimations.

4. Data Description

Our initial sample consists of 203 Italian non-financial listed firms that represent all Italian non-financial firms listed in 2000 on the Milan Stock Exchange. For the initial sample, we have checked data availability about accounting- and market-based data as well as information concerning a firm's ownership and control structure. Market-based information is collected from Datastream-Thomson Reuters database. Accounting-based information as well as information concerning a firm's ownership and control structure is collected from the following sources:

- Calepino dell'Azionista, a yearly publication edited by the research department of Mediobanca, the largest Italian investment bank, which provides information about the ownership structure of Italian listed firms, their accounting data, and biographical sketch, including address, foundation date, business description, etc..
- CONSOB web site, the web site of the public authority responsible for regulating the Italian securities market, which provides information about the "relevant" shareholders, that is, shareholders owning an equity stake equal to or greater than 2% in a listed firm.
- R&S-Mediobanca, a yearly publication edited by the research department of Mediobanca, which provides information about consolidated and non-consolidated financial statements, and the ownership structure of the main Italian listed and privately-held corporate groups. Missing information about non-consolidated financial statements is collected from Settori-Online, a yearly publication edited by the research department of Mediobanca, which also provides information about non-consolidated financial statements of the main Italian listed and privately-held firms.
- Reports of chambers of commerce, which provide information about a firm's ownership structure. This source is used in order to fill missing data from the previous databases.
- Lexis-Nexis, which allows us to read annals of the most important Italian and international newspapers (e.g., Il Sole 24 Ore, La Stampa, The Wall Street Journal, Financial Times, etc.).

From the initial sample, we have left out firms with missing and incomplete data during the period starting in 2000 and ending in 2006, in order to obtain a balanced panel required to obtain more reliable estimations when using panel data models. The final sample consists of 107 Italian non-financial listed firms analyzed from 2000 to 2006 (749 firm-year observations).

Variable y (***market_leverage***) (Note 1) is our leverage measure defined as: $\dfrac{\text{interest - bearing debt}}{\text{interest - bearing debt} + \text{equity}}$

Interest-bearing debt is the book value of interest-bearing debt and *equity* is a firm's market capitalization. Vector $X_{i,t}$ includes observations of the $i-th$ firm at time t of the following variables.

4.1 Independent Variables

Votes-to-capital ratio is the ratio between voting rights and cash flow rights of the ultimate controlling shareholder. The ratio is the common measure of the separation between ownership and control. Voting rights are the result of the application of the weakest-link rule (Faccio & Lang, 2002): in a control chain, the voting power held by the ultimate controlling owner is given by the voting stake held in the weakest link of the chain as this link is the most exposed to takeovers. Cash flow rights correspond to cash flow rights held by the ultimate largest shareholder. They are calculated by relying on the input-output model (Leontief, 1986) applied to shareholdings (Note 2).

Family is a dummy variable taking value 1 if the firm is family-controlled, 0 otherwise. A firm is family-controlled if the ultimate largest shareholder is a group of people linked by kinship that hold at least a 30% voting stake as a whole. According to the Italian law on mandatory tender offers, a controlling shareholder is defined as an individual that holds at least a 30% voting stake. The identity of the ultimate largest shareholder is outlined by using R&S-Mediobanca database and the reports of chambers of commerce that also show the ownership structure of non-listed firms (in pyramidal groups, holding and sub-holding firms are often non-listed companies). The family is identified by surname (stakes held by relatives with the same surname are considered as a whole). For families with more than one branch and family members with different surnames (e.g., founder's wife, sons of female heirs, etc.), family affiliation is also controlled by using Google search engine and Lexis-Nexis database to read annals of the most important Italian and international newspapers (e.g., Il Sole 24 Ore, La Stampa, The Wall Street Journal, Financial Times, etc.) (Note 3).

4.2 Control Variables

Firm_age is the natural logarithm of the number of years since firm foundation. Firm age could be used as a proxy for the business growth stage. Older firms are likely to be in a maturity stage, with stable cash flows, and therefore raise more debt.

Firm_size is the natural logarithm of a firm's total assets. Larger firms are likely to be more diversified, to bear lower bankruptcy risks, and to find an easier access to debt market as a result of their better reputation and greater tangible assets. According to the trade-off theory, a positive correlation with leverage is expected. Conversely, the pecking order hypothesis (POH) predicts a negative relationship with leverage: larger and older firms are better known and could have had a history of retained earnings.

Cash: $\frac{\text{cash and equivalents}}{\text{total assets}}$. The higher the degree of liquidity, the lower the financing needs and the bankruptcy risks should be. According to the POH, a negative relationship with leverage is expected as a result of available internal funds (at the apex of the hierarchy). Lower bankruptcy risks could lead to higher debt ratios according to the trade-off theory.

Market-to-book ratio is the natural logarithm of a firm's market-to-book ratio. It is a proxy for a firm's growth opportunities. Prevalent literature discusses and finds a negative correlation with leverage by relying on the trade-off theory. Several explanations are provided. First, firms with a higher market-to-book ratio are likely to show lower agency costs of free cash flow (Jensen, 1986). Second, a high market-to-book ratio could be due to a high incidence of intangible assets and related bankruptcy costs. Third, growth opportunities could lead to higher agency costs of debt as a result of asset substitution risks. The POH provides a different scenario: profitability being equal, firms with more investment opportunities should accumulate more debt over time. Thus, growth opportunities and leverage are positively related under the POH.

Institutional is the percentage of shares held by institutional shareholders (banks, insurance companies, mutual funds, etc.). The stake held by institutional shareholders is a proxy for the relevance of outside blockholders. We only consider institutional investors that are not linked to the largest shareholder by syndicates. The expected link with leverage is negative: institutional investors are typically minority shareholders and may be concerned of being expropriated by the majority shareholders, especially when the separation between ownership and control is large.

Operating_leverage: $\frac{\text{depreciation} + \text{labor cost}}{\text{sales}}$. This ratio expresses the incidence of fixed costs and, therefore, is a proxy for a company's operating income volatility. Firms with more volatile operating cash flows face higher expected costs of financial distress and should use less debt. Moreover, a more volatile operating income increases the probability that, in some scenarios, interest expense will exceed EBIT, therefore reducing tax benefits of debt. In addition, depreciation expense and labor cost are tax shields that substitute interest expenses. Thus, higher risk and non-debt tax shields should result in lower debt ratios under the trade-off theory. According to the POH, higher risk implies higher adverse selection problems. So, under the POH, the link with leverage should be positive.

Roa: $\frac{\text{ebit}}{\text{total assets}}$. According to the static trade-off theory, profitable firms face lower expected costs of financial distress and find interest tax shields more valuable. Thus, the tax and bankruptcy costs perspectives predict profitable firms to be more indebted. In addition, the agency costs perspective predicts that the discipline provided by debt is more valuable for profitable firms as these firms are likely to have severe free cash flow problems. In a dynamic trade-off model, leverage can appear to be negatively related to profitability due to various frictions (Kayhan & Titman, 2007; Strebulaev, 2007). The POH argues that firms prefer internal funds over external funds. Investments and dividends being equal, more profitable firms will become less leveraged over time.

Tangible: $\frac{\text{tangible assets}}{\text{total assets}}$. Tangible assets, such as property, plant, and equipment, are easier for investors to value than intangibles, such as goodwill, patents, brands, etc. This decreases expected costs of financial distress. Furthermore, tangibility makes it unlikely for shareholders to face asset substitution problems. The lower expected costs of distress and fewer debt-related agency problems predict a positive relation between tangibility and leverage according to the trade-off theory. The POH makes opposite expectations. Low information asymmetry associated with tangible assets makes equity issuances less costly. Leverage ratios should therefore be lower for firms with higher tangibility.

Target is a dummy variable taking value 1 if the difference between the target leverage estimated as predicted values of Equation (1) and the observed levels of leverage is either lower than 10th percentile or higher than 90th percentile. This variable captures firms with suboptimal capital structures that should converge on the target more quickly under the trade-off theory. We argue that the larger the distance from the target leverage, the greater the costs of deviating from the target will be.

Tax_rate is the effective corporate tax rate measured as follows: $\frac{\text{tax expenses}}{\text{pre - tax profit}}$. According to the trade-off theory, firms paying a high amount of taxes want to reduce their taxable income by increasing deductible expenses, such as interests, in order to increase firm value. We therefore expect a positive relationship between the effective corporate tax rate and debt ratios.

5. Results

Table 1 provides descriptive statistics and the univariate analysis comparing family firms with non-family counterparts. As expected, family-controlled firms appear to use control-enhancing devices more extensively (higher *votes-to-capital ratio*), consistently with previous evidence outside Italy (e.g., Morck et al., 2005; Villalonga & Amit, 2009). Moreover, family firms seem to be significantly more indebted than non-family ones (*market_leverage*). The univariate analysis also shows that family firms are less appealing to institutional investors (*institutional*), have poorer growth opportunities (*market-to-book ratio*), but have a better accounting-based performance (*roa*). They also have a lower operating risk (*operating_leverage*) and a lower effective corporate tax rate (*tax_rate*).

Table 1. Descriptive statistics[a]

	Full sample			Family firms (FF)			Non-family firms (NFF)			
Variables	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	FF - NFF
market_leverage	0.3215	0.2851	0.2420	0.3422	0.3057	0.2394	0.2896	0.2430	0.2429	0.0526***
family	0.6061	1.0000	0.4889							
institutional	0.0547	0.0232	0.1018	0.0349	0.0201	0.0462	0.0850	0.0415	0.1468	-0.0501***
votes-to-capital ratio	1.2617	1.0000	0.6654	1.3263	1.0000	0.7988	1.1624	1.0000	0.3563	0.1639***
firm_size	13.1230	12.8900	1.8154	13.2760	13.0610	1.6656	12.8880	12.2320	2.0047	0.3880***
market-to-book ratio	0.5100	0.4447	0.6656	0.4614	0.3853	0.6858	0.5849	0.5710	0.6271	-0.1235**
roa	0.0524	0.0576	0.0884	0.0672	0.0666	0.0652	0.0295	0.0421	0.1116	0.0377***
tangible	0.2381	0.1968	0.1887	0.2496	0.2160	0.1776	0.2204	0.1639	0.2037	0.0292**
operating_leverage	0.2750	0.2455	0.1398	0.2497	0.2345	0.1216	0.3138	0.2600	0.1564	-0.0641***
cash	0.1399	0.0921	0.1408	0.1427	0.0903	0.1443	0.1355	0.1000	0.1353	0.0072
firm_age	3.3505	3.3673	0.9433	3.3913	3.4657	0.8758	3.2876	3.0910	1.0369	0.1037
tax_rate	0.4186	0.4133	0.1826	0.3877	0.3882	0.1708	0.4661	0.4540	0.1900	-0.0784***

[a] The table reports descriptive statistics (mean, median, and standard deviation) of the variables employed in the regressions for the entire sample, the subsample of family firms, and the subsample of non-family firms. FF – NFF reports the difference of means between family and non-family firms. t-test significance levels: * (10%), ** (5%), *** (1%).

Pearson correlations (Table 2) do not show any multicollinearity problem among our independent and control variables.

Table 2. Correlation matrix[b]

Variables	[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]
[A] market_leverage	1	**0.1062**	-0.0213	**0.1293**	**0.4431**	**-0.4906**	**-0.1982**	**0.2322**	**-0.2616**	**-0.2976**	**0.4118**	**0.0892**
[B] family		1	**-0.2403**	**0.1204**	**0.1043**	**-0.0907**	**0.2092**	**0.0757**	**-0.2243**	0.0249	0.0538	**-0.2099**
[C] institutional			1	-0.0281	0.0425	0.0435	0.0127	0.0218	-0.0166	**-0.0968**	-0.0057	0.0327
[D] votes-to-capital ratio				1	**0.3209**	-0.0111	**0.0868**	0.0602	-0.0018	-0.0102	**0.1980**	-0.0538
[E] firm_size					1	**-0.0845**	**0.1872**	**0.1288**	**-0.2903**	**-0.0910**	**0.4115**	**-0.1733**
[F] market-to-book ratio						1	**0.1200**	**-0.1257**	**0.2502**	0.0294	**-0.3072**	-0.0062
[G] roa							1	**0.1163**	**-0.2820**	**0.0773**	**0.0864**	**-0.2004**
[H] tangible								1	0.0571	**-0.3009**	**0.3257**	**-0.0765**
[I] operating_leverage									1	**0.1530**	**-0.1479**	**0.1730**
[J] cash										1	**-0.2155**	**-0.1675**
[K] firm_age											1	**-0.0755**
[L] tax_rate												1

[b] The table reports Pearson correlations for the variables employed in the regressions. Correlations significant at the 5% level or above are in bold.

Table 3 shows Equation (1) estimations by a fixed effects model. With reference to our independent variables, *family* and *votes-to-capital ratio*, estimated parameters point out that neither *family* nor *votes-to-capital ratio*, appear to be significantly linked to leverage. First, this means that, contrary to our Hypothesis 1, family firms are not significantly more leveraged than non-family counterparts; second, firms characterized by a higher separation between ownership and control, which therefore face more severe Type II agency costs, do not seem to exploit leverage to a greater extent. More interestingly, and consistently to our Hypothesis 2, family ownership moderates the relationship between leverage ratio and votes-to-capital ratio. In fact, the product term between *family* and *votes-to-capital ratio* is positive and statistically significant. This means that the relationship between leverage and separation is positive and statistically significant only in the subsample of family firms.

With reference to our control variables, the results are largely consistent with our expectations. According to the trade-off theory, leverage increases with firm size (*firm_size*) and the effective corporate tax rate (*tax_rate*); it decreases with the *market-to-book ratio* and the level of operating risk (*operating_leverage*). According to the POH and the dynamic trade-off model, leverage decreases with a firm's profitability (*roa*). Finally, as expected, the presence of institutional investors (*institutional*) is negatively related to leverage.

Table 3. Capital structure determinants[c]

	Dependent variable: market_leverage			
Variables	(1)	(2)	(3)	(4)
family	-0.0289	-0.0168	-0.0288	-0.0167
	(0.0441)	(0.0433)	(0.0438)	(0.0430)
institutional	-0.1825**	-0.1785**	-0.1838**	-0.1803**
	(0.0789)	(0.0771)	(0.0796)	(0.0781)
votes-to-capital ratio	0.0279	-0.0458	0.0284	-0.0451
	(0.0319)	(0.0498)	(0.0330)	(0.0504)
firm_size	0.1406***	0.1388***	0.1406***	0.1388***
	(0.0313)	(0.0315)	(0.0314)	(0.0315)
market-to-book ratio	-0.1048***	-0.1053***	-0.1048***	-0.1053***
	(0.0174)	(0.0172)	(0.0174)	(0.0173)
roa	-0.3671***	-0.3531***	-0.3669***	-0.3529***
	(0.1138)	(0.1150)	(0.1138)	(0.1151)
tangible	-0.0570	-0.0124	-0.0571	-0.0125
	(0.1190)	(0.1223)	(0.1192)	(0.1225)
operating_leverage	-0.2314*	-0.2250*	-0.2312*	-0.2248*
	(0.1298)	(0.1289)	(0.1299)	(0.1290)
cash	-0.1234	-0.1180	-0.1234	-0.1179
	(0.0950)	(0.0962)	(0.0949)	(0.0962)
firm_age	0.0521	0.0406	0.0522	0.0406
	(0.0413)	(0.0399)	(0.0413)	(0.0399)

tax_rate	0.0598**	0.0618**	0.0599**	0.0618**
	(0.0258)	(0.0256)	(0.0258)	(0.0256)
family*votes-to-capital ratio		0.1011**		0.1012**
		(0.0461)		(0.0460)
institutional*votes-to-capital ratio			-0.0116	-0.0164
			(0.1682)	(0.1674)
R-squared	0.8860	0.8868	0.8860	0.8868
Adjusted R-squared	0.8636	0.8643	0.8633	0.8641
Observations	749	749	749	749

[c] The table reports estimations of Equation (1) by a fixed effects model. All regressions include time dummies. HAC standard errors are in parentheses. Significance levels: * (10%), ** (5%), *** (1%).

Moving on to the estimation of the speed of adjustment by GMM-SYS estimator (Table 4), the coefficient of the lagged dependent variable, which indicates the speed of adjustment, in all models of Table 4, is as much as 0.65-0.60, which corresponds to a half-life of about 1.35 years (Note 4). The average firm in the sample closes about 35-40% of the gap between past and desired level of leverage within one year. According to our Hypothesis 3, family firms adjust their leverage ratio towards the target more slowly. In fact, Models (5) and (6) of Table 4 show estimations of the interaction term defined as product between *market_leverage* (-1) and *family*. The coefficient of the interaction variable is positive and statistically significant. For example, Model (5) of Table 4 points out that non-family firms close about 43% of the gap between past and desired level of leverage within one year (1-0.5707). In family firms, the gap closed within one year is about 34% (1-0.5707-0.0835).

Regarding to our independent and control variables, it is worth noticing that *family* and *votes-to-capital ratio* turn to be statistically significant in Table 4. This evidence may appear in contrast to the results found in Table 3. The main explanation of this apparently inconsistent result resides in the estimator properties. The fixed effects model presented in Table 3 does not permit the inclusion of time invariant independent variables. In our case, *family* is almost always constant over time because the controlling family is reluctant to give up control to non-family shareholders. Therefore its coefficient cannot be reliably estimated by the fixed effects model.

Table 4. Capital structure determinants and the estimation of the speed of adjustment[d]

	Dependent variable: market_leverage					
Variables	(1)	(2)	(3)	(4)	(5)	(6)
market_leverage (-1)	0.6616***	0.6732***	0.6163***	0.6137***	0.5707***	0.6149***
	(0.0164)	(0.0168)	(0.0140)	(0.0143)	(0.0288)	(0.0338)
family	0.0200***	0.0214***	0.0123**	0.0134**	-0.0130	-0.0089
	(0.0051)	(0.0050)	(0.0054)	(0.0054)	(0.0134)	(0.0143)
institutional	-0.0720***	-0.0744***	-0.2763***	-0.2885***	-0.2259***	-0.2368***
	(0.0141)	(0.0137)	(0.0344)	(0.0353)	(0.0397)	(0.0386)
votes-to-capital ratio	-0.0028	-0.0169**	0.0011	-0.0219***	-0.0309***	-0.0273***
	(0.0037)	(0.0077)	(0.0052)	(0.0081)	(0.0081)	(0.0082)
firm_size	0.0204***	0.0193***	0.0216***	0.0219***	0.0234***	0.0219***
	(0.0023)	(0.0022)	(0.0021)	(0.0022)	(0.0021)	(0.0021)
market-to-book ratio	-0.0667***	-0.0659***	-0.0703***	-0.0704***	-0.0673***	-0.0659***
	(0.0042)	(0.0041)	(0.0030)	(0.0030)	(0.0035)	(0.0039)
roa	-0.3820***	-0.3636***	-0.3706***	-0.3662***	-0.3406***	-0.3392***
	(0.0251)	(0.0248)	(0.0205)	(0.0209)	(0.0110)	(0.0222)
tangible	0.0418***	0.0437***	0.0541***	0.0580***	0.0661***	0.0479***
	(0.0154)	(0.0165)	(0.0151)	(0.0155)	(0.0159)	(0.0165)
operating_leverage	-0.0322*	-0.0270	-0.0685***	-0.0701***	-0.0535***	-0.0461***
	(0.0169)	(0.0167)	(0.0120)	(0.0119)	(0.0131)	(0.0125)
cash	-0.0922***	-0.0869***	-0.1148***	-0.1144***	-0.1223***	-0.1208***
	(0.0170)	(0.0175)	(0.0158)	(0.0159)	(0.0161)	(0.0162)
firm_age	-0.0004	-0.0008	0.0014	0.0008	-0.0002	0.0002
	(0.0031)	(0.0030)	(0.0028)	(0.0029)	(0.0030)	(0-0029)
tax_rate	0.0632***	0.0607***	0.0693***	0.0693***	0.0680***	0.0665***

	(0.0086)	(0.0087)	(0.0077)	(0.0075)	(0.0078)	(0.0075)
family*votes-to-capital ratio		0.0181**		0.0244***	0.0364***	0.0290***
		(0.0076)		(0.0066)	(0.0057)	(0.0060)
institutional*votes-to-capital ratio			-0.0900	-0.0826	0.0103	-0.0096
			(0.0725)	(0.0719)	(0.0749)	(0.0725)
market_leverage (-1)*family					0.0835**	0.0699*
					(0.0361)	(0.0390)
market_leverage (-1)*target						-0.0892***
						(0.0237)
target						0.0280***
						(0.0085)
Observations	642	642	642	642	642	642
Test for AR(1) errors	-3.7802 (0.0002)	-3.7001 (0.0002)	-3.8705 (0.0001)	-3.7633 (0.0002)	-3.7829 (0.0002)	-3.9587 (0.0001)
Test for AR(2) errors	-1.0332 (0.3015)	-1.0215 (0.3070)	-0.9513 (0.3415)	-0.8999 (0.3682)	-0.9681 (0.3330)	-0.9612 (0.3364)
Sargan test	76.548 (0.3654)	77.247 (0.4386)	81.0854 (0.6001)	81.0352 (0.6016)	82.7742 (0.5174)	81.1961 (0.5043)
Wald (joint) test	16742 (0.0000)	19192.9 (0.0000)	21349.1 (0.0000)	23034.7 (0.0000)	26788 (0.0000)	31362 (0.0000)
Wald (time dummies)	534.741 (0.0000)	524.682 (0.0000)	991.519 (0.0000)	911.177 (0.0000)	770.991 (0.0000)	441.506 (0.0000)

[d] The table reports estimations of Equation (3) by GMM-SYS (Blundell and Bond, 1998). All regressions include time dummies. Asymptotic standard errors that are robust to heteroskedasticity and small sample bias are given in parentheses under the coefficients. AR(1) errors and AR(2) errors are the first- and second-order autocorrelations of residuals, which are asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation (in parentheses, the p-value of the test statistic). Sargan test is a test of the over identifying restrictions, asymptotically distributed as χ^2 (df) under the null hypothesis of the instruments validity (in parentheses, the p-value of the test statistic). The Wald statistics test the joint significance of estimated coefficients, asymptotically distributed as χ^2 (df) under the null hypothesis of no relation (in parentheses, the p-value of the test statistic). Significance levels: * (10%), ** (5%), *** (1%).

The same problem does not affect the variable *votes-to-capital ratio* which experiences small changes over time as a result of ownership structure modifications. On the contrary, GMM-SYS estimator presented in Table 4 also allows time invariant independent variables to be included and consistently estimated. Therefore, results in Table 4 support Hypothesis 1, according to which family firms are significantly more indebted than non-family counterparts, and confirm Hypothesis 2, which claims a positive relationship between separation and leverage but only in family firms. Control variables are largely consistent with the results already shown in Table 3. In Table 4, we also allow for the different converging paths depending on the presence of deviations from the target leverage. The interaction variable expressed as product between *target* and *market_leverage* (-1) allows us to distinguish the different speed between firms with extreme leverage ratios (underleveraged and overleveraged firms) and firms with debt levels nearer to the target. As expected, Model (6) of Table 4 suggests a negative and statistically significant coefficient for the interaction term. Firms with capital structures departing from the target struggle to converge on it at a faster pace.

The speed of adjustment is also estimated by the LD estimator that fits well persistent data series and short sample periods such as ours. Table 5 reports estimations of the LD estimator in the form of Equation (5) using two differencing lengths, k=3 and k=4. The values reported in Table 5 result from the third iteration of Equation (5). The evidence shows that the speed of adjustment goes down (now it is about 24%), therefore confirming the fact that GMM-SYS estimator tends to be biased upwards (Huang & Ritter, 2009).

Table 5. Capital structure determinants and the estimation of the speed of adjustment: The long difference instrumental variables estimator[e]

	Dependent variable: Δmarket_leverage$_{t,t\text{-}k}$	
Variables	(1) k=3	(2) k=4
Δmarket_leverage$_{t-1,t-k-1}$	0.7699***	0.7578***
	(0.1374)	(0.0955)
Δfamily$_{t,t-k}$	0.0515*	0.0143
	(0.0289)	(0.0402)
Δinstitutional$_{t,t-k}$	0.0572	0.0434
	(0.0941)	(0.1024)
Δvotes-to-capital ratio$_{t,t-k}$	0.1230**	0.1152**
	(0.0592)	(0.0505)
Δfirm_size$_{t,t-k}$	0.0934***	0.0765***
	(0.0260)	(0.0275)
Δmarket-to-book ratio$_{t,t-k}$	-0.1046***	-0.0945***
	(0.0195)	(0.0217)
Δroa$_{t,t-k}$	-0.3909***	-0.2524***
	(0.1167)	(0.0877)
Δtangible$_{t,t-k}$	-0.0363	-0.0818
	(0.0810)	(0.0994)
Δoperating_leverage$_{t,t-k}$	-0.3264***	-0.2666**
	(0.1151)	(0.1265)
Δcash$_{t,t-k}$	-0.0910	-0.3236**
	(0.1202)	(0.1347)
Δfirm_age$_{t,t-k}$	-0.1079***	-0.1111***
	(0.0336)	(0.0285)
Δtax_rate$_{t,t-k}$	0.0504	0.1483***
	(0.0464)	(0.0523)
R-squared	0.5676	0.6430
Adjusted R-squared	0.5522	0.6236
Observations	321	214

[e] The table reports estimations of Equation (5) by the long difference instrumental variables estimator. The differencing length is k=3 (Model 1) and k=4 (Model 2). All regressions include time dummies. HAC standard errors are in parentheses. Significance levels: * (10%), ** (5%), *** (1%).

Finally, as robustness check, we also estimate the speed of adjustment by using OLS regressions and fixed effects model (Table 6). According to Bond (2002), the coefficient of the lagged dependent variable should always lie between the upper bound given by fixed effects estimations and the lower bound given by OLS estimations. LD and GMM-SYS estimator results appear to be consistent with Bond (2002).

6. Discussion and Conclusion

By relying on the agency theoretical model, our study examines the relationship between family ownership and debt financing both in a statistic and dynamic context. Since the analysis is performed in Italy, we try to disentangle the family ownership effect on leverage ratio from the effect related to the presence of separation between voting rights and cash flow rights. We also try to show potential interactions between the two characters. Extant literature focuses on both characteristics separately and overlooks the fact that, first, separation between ownership and control may be a factor that tilts the relationship between family ownership and leverage, second, the family character of ownership may affect the relationship between separation and debt ratio.

Table 6. Capital structure determinants and the estimation of the speed of adjustment by OLS and fixed effects model[f]

	Dependent variable: market_leverage	
Variables	(1)	(2)
market_leverage (-1)	0.7953***	0.4747***
	(0.0234)	(0.0647)
family	0.0207**	0.0114
	(0.0084)	(0.0385)
institutional	-0.0609	-0.0670
	(0.0451)	(0.0867)
votes-to-capital ratio	-0.0040	0.0649*
	(0.0041)	(0.0339)
firm_size	0.0103***	0.1224***
	(0.0024)	(0.0284)
market-to-book ratio	-0.0356***	-0.0966***
	(0.0069)	(0.0170)
roa	-0.3034***	-0.3902***
	(0.0673)	(0.1100)
tangible	0.0113	-0.0320
	(0.0214)	(0.0887)
operating_leverage	-0.0212	-0.2491**
	(0.0307)	(0.1081)
cash	-0.0943***	-0.1315
	(0.0250)	(0.1146)
firm_age	-0.0009	0.0511
	(0.0039)	(0.0373)
tax_rate	0.0623***	0.0391
	(0.0200)	(0.0265)
R-squared	0.8713	0.9212
Adjusted R-squared	0.8678	0.9025
Observations	642	642

[f] The table reports estimations of Equation (3) by OLS (Model 1) and fixed effects model (Model 2). All regressions include time dummies. HAC standard errors are in parentheses. Significance levels: * (10%), ** (5%), *** (1%).

In line with our Hypothesis 1, we find that family firms are more indebted than non-family counterparts. Family firms seem to exploit debt to a greater extent in order to hold control in a country characterized by high private benefits of control and the inclination of family firms to make large use of control-enhancing devices. Besides, family firms are likely to find debt financing less costly as a result of the strong ties between family owners and banks, that reduce agency conflicts between creditors and shareholders as opposed to the higher Type II agency problems that make equity financing more expensive. Debt allows the business to grow without forcing the controlling family to have to deal with control dilution problems. More importantly, even in case of bankruptcy of a highly leveraged operating unit, the large use of pyramidal structures, together with the limited liability of the holding company, allow the controlling family to maintain the control of the group and to bear only a small portion of the wealth destruction. The higher leverage in family-owned listed firms is consistent with previous studies that rely on the agency approach (e.g., Harijono et al., 2004; King & Santor, 2008).

We further assume that family ownership may moderate the relationship between separation and leverage because the higher inclination of family owners to divert wealth at the expense of minority shareholders may induce them to exploit leverage to a greater extent as a mechanism to inflate assets under domination, especially when the share of cash flow rights is disproportionately lower than the share of voting rights. According to Hypothesis 2, we find that separation between voting rights and cash flow rights is positively related to leverage if and only if the controlling shareholder is a family. Most studies that examine the relationship between separation and leverage link it to the quality of capital market scrutiny (e.g., Faccio et al., 2007 and 2010; Paligorova & Xu, 2012). We add a piece to the puzzle: the higher leverage in firms characterized by high separation may also be related to the fact that most of the firms employing control-enhancing devices are controlled by a family, more inclined to acquire private benefits through debt-inflated assets. Conversely, non-family firms do not seem to show any expropriation risk through debt: higher separation between ownership and control leads to lower debt ratios. From the demand side, non-family shareholders are less inclined to divert assets at the expense of minority shareholders and, therefore, non-family firms' debt reliance is lower. From the supply side, non-family firms can negotiate with creditors to a lesser extent than family firms due to missing or insufficient relationships and connections; this causes lenders to require lower debt levels or impose tighter credit conditions when expropriation risks increase.

Within a dynamic context, family ownership may also influence the adaptation of debt levels to the extent that it affects the adjustment costs and the costs of deviating from the target leverage. Under our assumptions, family firms should bear higher adjustment costs because poor Type II agency relationships make access to public capital markets more difficult and expensive; vice versa, the costs of deviating from the target leverage should be lower. In fact, trust-based and long-lasting relationships between family owners and banks make deviations from the target leverage more negotiable without an immediate market penalty. Consistent with our Hypothesis 3, we find that family firms rebalance their leverage ratio towards the target at a slower pace than non-family counterparts. This evidence, to the best of our knowledge, is the first contribution to the research stream of dynamic capital structure and the determinants of the speed of adjustment. We find a speed of adjustment of about 35-40% for the entire sample, 43% for non-family firms, and 34% for family firms. The speed of adjustment for the whole sample decreases to about 24% by using the LD estimator.

Our study advances the literature on family business financing decisions in several ways. First of all, we lend further support to previous studies claiming that family owners of listed firms may desire to hold control and to appropriate wealth at the expense of minority shareholders by means of debt (e.g., Wiwattanakantang, 1999; Harijono et al., 2004; King & Santor, 2008). Second, we propose a further explanation of why firms having cash flow rights that deviate from voting rights may tend to be more leveraged (e.g., Faccio et al., 2007, 2010; Paligorova & Xu, 2012). Third, we demonstrate that family firms tend not to follow models of optimal leverage when choosing their capital structure in the sense that capital structure adjustments towards the optimal level take place more infrequently than they do in non-family firms.

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Notes

Note 1. Hereafter, the lagged value of each variable will be indicated as follows: VARIABLE NAME (-k), where k indicates the number of lags. For example, market_leverage (-1) indicates the variable market_leverage at time t-1.

Note 2. Cash flow rights held by an external shareholder in firm i are as follows:

$$Y_i = \sum_j a_{j,i} Y_j + X_i$$

where $a_{j,i}$ is the direct stake held by firm j in firm i; Y_j and Y_i are cash flow rights held by an external shareholder, respectively, in firm j and in firm i; X_i is the direct stake held by the same external shareholder in firm i. We have to estimate Y_i by solving a system of linear equations; the number of equations and unknowns corresponds to the number of firms in the group.

Note 3. When the majority stake is held by an individual owner, we also require at least a relative of the controlling shareholder on the board. This condition allows us to exclude cases in which the firm is controlled by professional managers without any family involvement.

Note 4. The half-life can be calculated as follows: $\ln(1/2) / \ln(\lambda)$.

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Profitability of Banks in Lebanon: Some Theoretical and Empirical Results

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Abstract

The paper, instead of relying on ad hoc measures, derives a simple theoretical model for the income of a commercial bank. This model identifies eight internal exogenous factors to the profitability of these banks. A total panel of 39 banks over the twelve-year period 2003-2014 is studied. The dependent variable is taken to be the return on average total assets (ROAA). The estimation procedure is through panel least squares. Fixed effects and random effects are considered. The results support the cross section fixed effects model, which brings to light the heterogeneity of banks in Lebanon. Four out of the eight factors are found to be statistically highly significant, explaining about 50% of the variation in ROAA. These are: the interest rate spread, the capital adequacy ratio, the cost to income ratio, and the ratio of non-interest income to total assets. Dynamics are included in the model by adding to the regressors the first lag of the dependent variable. This makes for different short run and long run impacts, with the latter found to be higher than the former as economic theory postulates. Among other recommendations banks are advised to diversify their income towards more wealth management and investment banking, to pay particular attention to their traditional source of income, which is the interest rate spread between loans and deposits, and to manage carefully their cost structure.

Keywords: commercial banks, profitability, ROAA, internal factors, Lebanon, panel least squares

1. Introduction

At least since the early 1990s, Lebanese banks have been on the rebound. After the devastating civil war of 1975-1990, they have managed to re-capitalize, consolidate, and re-invent themselves as the most crucial sector in the economy. They have also been guided by an effective regulatory system at the Central Bank of Lebanon. But the past twenty five years have not been easy, since the country has remained to this day mired in frequent economic and political shocks. Paradoxically, this has strengthened Lebanese banks, in the sense that it enabled them to hone their skills in managing under conditions of high uncertainty and it drove them to expand in the region so as to diversify risk and revenue. Of course, that was not cost free. It led Lebanese banks to become more conservative, something that has elevated their costs and dented their profitability, since their relative profitability rates ended up lower than the regional averages (Note 1). In terms of the return on average assets, ROAA, and the return on average equity, ROAE, Lebanese rates stood at 1% and 11% respectively, against corresponding rates of 1.6% and 12.5% for the region (Note 2). However, that has also made Lebanon a destination for safe and responsible banking, helping to increase its deposit base to close to 300% of GDP (Note 3).

It is interesting, then, to see how Lebanese banks have maintained their steady-albeit relatively lower -profitability and to check what its major determinants are, especially at this time when prolonged instabilities are starting to leave their scars on Lebanese banks' performance (Note 4). The literature on bank profitability is extensive, but has not yet made a noticeable inroad into Lebanese banking. A brief look at this literature reveals that it is centered on three sets of determinants: internal or bank-specific (i.e. capital adequacy, credit risk, bank size, operational efficiency, liquidity, non-interest income); industry-specific (i.e. ownership, concentration); and external or macroeconomic (i.e. GDP growth, inflation, interest rates) (Note 5). The external determinants are the least problematic, since almost all evidence points rightly to a positive relation between its three variables and bank profitability (Note 6). The industry-specific determinants are a bit problematic, but only as far as ownership is concerned, since the evidence overwhelmingly finds that bank profitability and concentration are directly related. However, the uncertainty regarding bank ownership centers on foreign ownership not private ownership, the latter being almost always more profitable than public ownership. As to foreign ownership, the effect seems to depend on whether technological advantages of foreign banks outweigh their informational disadvantages in domestic markets or not. More problematic are the effects of internal determinants, and they primarily relate to capital adequacy, credit risk, and bank size. Well-capitalized banks could be losing in foregone higher interest, or could be reaping cost advantages due to their stronger financial position, with hence an uncertain impact on profitability. Higher credit risk could translate to larger returns, or alternatively to higher non-performing loans and provisions, such that its effect on profitability is indeterminate. Larger bank size could equally mean more scale economies or more scale diseconomies, and thus opposing impacts on profitability, but just as likely it could imply a non-linear relation between bank size and profitability (Note 7).

What about the limited evidence on Lebanese banks? It comes mainly in two strains, one relates profitability rates to a combination of the above set of variables, and the other relates net interest margin, NIM, to the same variables. Of the first strain, an early paper by Hakim and Neaime (2001) find ROAE to be negatively related to the capital adequacy ratio and positively related to credit risk, but unrelated to liquidity; whereas Peters et al (2004) find ROAA to have a positive relation with NIM but a negative one with bank size. As to the second strain, Saad and El-Moussawi (2012) find NIM to exhibit a positive relation with capitalization and bank size, but a negative relation with credit risk (Note 8); while Azar and Kouyoumijian (2016) arrive at similar results, but find additionally that NIM is negatively related to liquidity (Note 9).

Perhaps more importantly, what these few papers share is that they lack a theoretical model upon which to base these profitability results (Note 10). There is also no obvious delineation as to what constitutes exogenous and endogenous variables (Note 11). We will attempt to address those deficiencies in this short paper. We will do that by presenting a basic model of profit maximization for Lebanese banks, but one that recognizes the simple but profound fact that this is done under some constraints. These could be regulatory in nature like those that deal with capital adequacy and liquidity, and could be strategic in nature such as those that aim at diversification and risk control (Note 12).

In section 2, we present our basic model of constrained profit maximization, and derive a functional form that relates ROAA to a set of exogenous variables that capture the internal (and partly problematic) determinants of relative profitability. More specifically, in section 3 we estimate this model by regressing ROAA against 8 exogenous variables: net interest margin, cost-to-income, credit risk, capital adequacy, liquidity, provisions, non-performing loans, and non-interest income. The model is estimated over an unbalanced panel data comprising 39 commercial banks and stretching from 2003 to 2014, with 14 of the banks constituting the Alpha Group, the group of largest banks with deposits of $2 billion or higher (Note 13). We employ three different formulations in the estimation process: panel with Ordinary Least Squares, panel with fixed cross section effects, and panel with random cross section effects. The best fit formulation is the panel with fixed cross section effects, reflecting the valid heterogeneity among commercial banks in Lebanon. In section 4, we evaluate the estimated results, and argue that only four variables are most significant and robust in the panel fixed cross section formulation: net interest margin, cost-to-income ratio, capital adequacy ratio, and the ratio of non-interest income to assets. And of these four variables, only the capital adequacy ratio carries a sign opposite to the one obtained in the theoretical model, namely a positive relation with ROAA. In section 5, we summarize the results and conclude that banks in Lebanon should focus on strengthening these four variables to enhance their sustained profitability.

2. Basic Model

We depart from the standard modeling of bank profitability that is frequently done on an ad hoc basis, and present below a small, basic model of the *internal* determinants of profits in Lebanese banks. In terms of balance sheet items, assets, A, are made up of liquidity, LIQ, plus investments, I, and Loans, L (Note 14); liabilities are represented by deposits, D; and shareholders' equity are composed of tier I and II capital, C. Given this simple but accurate balance sheet structure, the representative Lebanese bank maximizes the following net income function, $\prod$:

$$\prod = (r - r_o)(A - C) + NII - (r - r_o) LIQ - (P^* - P) - \delta \{(r - r_o)(A - C) + NII - (r - r_o) LIQ - (P^* - P)\} \quad (1)$$

Subject to the following five constraints:

$$C/\theta A \geq \alpha \quad (2)$$

$$LIQ/A \geq \beta \tag{3}$$

$$P^*/NPL \geq \vartheta \tag{4}$$

$$NPL/C \leq \omega \tag{5}$$

$$NII/A \geq \psi \tag{6}$$

Equation (1) defines net income as the difference between operational revenue and cost. Operational revenue is equal to: net interest income made on A less of C, with r being the interest rate earned on I and L while r_o is the interest rate paid on D as the main source of funding for Lebanese banks (Note 15); plus non-interest income, NII (Note 16); minus net interest income lost on holding LIQ; and minus the difference between the desired level of loan-loss provisions, P*, and the actual level, P. As to operational cost, note that δ is the cost to income ratio, defined as operational cost divided by operational revenue. Hence, operational cost, C, becomes: $\delta\ \{(r - r_o)\ (A - C) + NII - (r - r_o)\ LIQ - (P^* - P)\}$.

Of course, net income is maximized subject to constraints, some are regulatory and some are imposed by management. The first of these constraints is given by equation (2), which reflects the capital adequacy ratio (CAR). This requirement as set by the Central bank of Lebanon (BdL) stipulates that the ratio of capital to risk-weighted assets, C/θA - with θ being the risk weight - should be at least equal to α = 12%, in accordance to Basel III requirements. Equation (3) represents the liquidity constraint, and indicates that the ratio of primary liquidity to assets should at a minimum be equal to β, where β is targeted at 30%. This constraint is also strictly binding since the unstable economic and political environment necessitates that Lebanese banks remain highly liquid, a position strongly favored by BdL as well (Note 17). The third constraint given by equation (4) concerns the coverage of non-performing loans, NPL. It is BdL-driven, and favors adequate coverage of NPL by desired (specific and collective) loan-loss provisions, P*, at a ratio, ϑ, that should at least be equal to 80% (Note 18). Equation (5) defines the fourth constraint, and it reflects the precautionary measure of not having NPL exceed a given percentage of C, preferably at ω = 30% (Note 19). The last constraint captures management's desire for diversification towards untraditional banking activities. As presented in equation (6), it aims at having non-interest income as a fraction of assets be equal to ψ, the latter preferably set at a minimum of 0.4%.

The constrained profit maximization given by equations (1)-(6) has six dependent variables (Note 20): A, C, P*, LIQ, NPL, and NII. The solution to these dependent variables should make them function of the following exogenous or independent variables: $(r - r_o)$, δ, θ, α, β, ϑ, ω, and ψ. The only questionable exogenous variables are the first three, but they can be adequately justified. Lebanon is a small, open economy with a monetary framework that pegs the exchange rate to the US Dollar, so effectively interest rates are set outside and are equal to international (US) rates plus a risk premium, and the same holds true for the net interest margin $(r - r_o)$. δ, the cost to income ratio, is trickier to justify, but it is not widely off the mark to assume that Lebanese banks try to target δ at no more than 55%. As to θ, which primarily measures credit risk, it can safely be considered as predetermined, given that the portfolio of outstanding loans at Lebanese banks is non-tradable and securitization is largely frowned upon by BdL (Note 21). Note that θ is a direct and exact measure of credit risk, unlike other measures that try to capture credit risk in a more indirect way (Note 22).

We will regress ROAA on the above exogenous variables. The reason that we adopt ROAA is that it is a more rigorous regressand than ROAE, since it is does not disregard the higher risk associated with leverage, and it captures any regulation concerning financial leverage that is widely regarded as being pretty tough on Lebanese banks by BdL (Note 23). And the reason that we could regress ROAA against our set of exogenous or explanatory variables is that since ROAA = ∏/A and since both A and the reduced-form equation for ∏ are function of these exogenous variables, then ROAA is function of them as well. We can find the comparative statics results on ROAA to be as follows:

$$ROAA = f\ (\underset{+}{r - r_o},\ \underset{-}{\delta},\ \underset{-}{\theta},\ \underset{-}{\alpha},\ \underset{-}{\beta},\ \underset{-}{\vartheta},\ \underset{+}{\omega},\ \underset{+}{\psi}) \tag{7}$$

Theoretically, the justifications for the comparative static results in equation (7) can be readily captured. A higher net interest margin adds to profitability because it enhances operating income; whereas a higher cost-to-income ratio decreases operating income, and reduces profitability as a result; higher credit risk necessitates more capital so as to abide by the stipulated CAR, and hence increases interest income forgone that in turn eats into profitability; the same equally applies to a higher CAR and a higher ratio of liquid assets; a higher level of desired provisions reduces net income and consequently profitability; a higher ω allows banks to effectively free up capital, and hence to increase interest income and profitability; and, lastly, a higher ratio of non-interest income reflects successful diversification and more profitability.

In the next section, we are going to estimate equation (7), which has been derived from solving the equation system identified by (1)-(6) and as a result is based on a theoretical but accurate depiction of Lebanese banks' profit maximization process. And, as argued earlier, it measures the impact on relative profitability of determinants that are only internal to the banks. We will also introduce a few dummy variables that capture important features that characterize the Lebanese banking system.

3. Estimation Results

We begin by outlining in Table (1) the descriptive statistics on all eight independent variables together with the dependent variable (ROAA) (Note 24). Note that all variables are in percent. In case of ROAA, the mean is 0.852% and the median is 0.895%. Although the range is wide, around 21.72%, the standard deviation is relatively low at 1.215%. In case of the independent variables, the average and median interest rate spreads ($r - r_o$) are respectively 2.212% and 2.050%. The cost-to-income ratio, δ, has a mean of 63.40% and a median of 60.95%. The standard deviation is close to the mean and median at 58.67%. Credit risk θ ranges on average between 57.5% and 60.3%, and has a relatively high standard deviation of 23.38%. The capital adequacy ratio, α, has a mean of 17.73% which is much higher than the median of 13.83% (Note 25). The distribution of this ratio is therefore skewed positively to the right. The liquidity ratio, β, varies widely between 2.65% and 99.73%. Nonetheless, the standard deviation is relatively low at 13.24%. The variable ϑ varies between zero, i.e. no loss provisions, to 195.68%, i.e. a loan loss provision of almost double the amount of non-performing loans. The variable ω, which relates non-performing loans to the capital base, varies between 16.64% and 128.55%, with a mean of 58.75% and a median of 60.48%. The standard deviation is relatively low at 27.98%. The final variable ψ is the ratio of non-interest income to total assets. It is relatively small, with a mean of 0.553% and a standard deviation of 0.404%.

Table 1. Descriptive statistics

Variable	mean	median	maximum	minimum	Standard deviation
ROAA	0.85218	0.89500	10.7600	-10.9600	1.21479
$(r - r_o)$	2.21214	2.05000	6.31000	-0.7000	0.96591
δ	63.3945	60.9500	458.960	-928.270	58.6765
θ	57.536	60.284	153.999	3.715	23.377
α	17.7330	13.8300	159.390	0.0000	16.6936
β	32.1963	30.3350	99.730	2.64592	13.2423
ϑ	77.2166	81.7050	195.680	0.0000	23.0531
ω	58.755	60.477	128.554	16.638	27.979
ψ	0.553	0.449	2.899	0.0000	0.404

Table 2 presents the empirical results of regressing ROAA on the eight exogenous variables, and on a dummy variable for the year 2006, the year of the summer war with Israel. Three different panel estimation procedures are adopted: Ordinary Least Squares (OLS), fixed cross section effects, and random cross section effects. It was not possible to test for time effects, whether fixed or random. In the first case the reason is the presence of perfect collinearity, and in the second case because of the unbalanced nature of the data. What is noteworthy is that the coefficient estimates in the OLS estimation and in the random cross section effects are almost the same, although the standard errors, and by implication the t-statistics, are different. Another noteworthy aspect of the results is the low Durbin Watson statistics. Lastly, the panel least squares with fixed cross section effects boosts the R-squared from around 15% to around 40%. A test on whether these fixed effects are redundant is rejected with a Chi-square statistic that has a p-value of less than 0.00005, under the null hypothesis of no fixed effects. This is evidence of heterogeneity between the cross sections that stand for individual banks. The Hausman test for correlated random effects, between the fixed cross section effects and the random cross section effects, rejects the specification with random effects with a Chi-square statistic that takes a p-value of less than 0.00005. And although the dummy variable is statistically significant in both the OLS specification and the panel least squares with random cross section effects, it is statistically insignificant in the model that was found superior to the above two, i.e. the panel least squares with fixed cross section effects.

Table 2. Panel least squares of the return on average assets (ROAA) on eight exogenous variables

The number of observations is 391, 36 cross sections, and 12 periods (2003-2014)

Regressor	Panel with Ordinary Least Squares	Panel with fixed cross section effects	Panel with random cross section effects
Constant	-1.05013 (3.82917)	-2.89944 (7.49237)	-1.05219 (4.53091)
$(r - r_o)$	0.27376 (3.80195)	0.83356 (8.12696)	0.27432 (4.49681)
δ	0.00227 (2.59360)	0.00418 (5.34192)	0.00228 (3.08039)
θ	0.00638 (2.56712)	0.00840 (2.85634)	0.00638 (3.03416)
α	0.00762 (2.15934)	0.01270 (2.70947)	0.00763 (2.55374)
β	0.01557 (3.23284)	0.01055 (1.96167)	0.01553 (3.81025)
ϑ	0.00058 (0.27101)	0.00229 (0.94745)	0.00059 (0.32377)
ω	0.00295 (1.43550)	0.00138 (0.73347)	0.00295 (1.69579)
ψ	-0.06340 (0.39313)	0.73876 (3.13837)	-0.06312 (0.46205)
Dummy 2006	0.48125 (2.55600)	0.26008 (1.59767)	0.48087 (3.01916)
Adjusted R-Squared	0.15425	0.39486	0.15436
Durbin-Watson	1.04348	1.66611	1.04347

Note. In parentheses are absolute t-statistics.

In what concerns the coefficient estimates, 5 out of 8 factors are found statistically significant in the OLS model and the panel least squares with random effects, and 6 out of 8 in the panel least squares with fixed cross section effects. It is remarkable to notice that all the signs of the estimated coefficients are positive except the coefficient on the non-interest income which is negative, but statistically insignificant, in two cases out of the three. In the superior model with fixed cross section effects this coefficient is positive and highly significant statistically. Finally, these results cannot be taken as truly as the results in Tables 3 and 4, because one variable is omitted from the analysis, which is the lagged dependent variable. It turns out that the inclusion of this variable alleviates the econometric anomaly of the presence of positive serial correlation in the residuals in the three models of Table 2.

In Table 3, four different models are estimated. The first is a panel least squares with OLS that includes the dummy for the year 2006. Since the latter turns out to have a statistically insignificant coefficient with a t-statistic of 0.76521, it is dropped from the other three models. Thus, excluding the dummy, the second model is a panel least squares with OLS ; the third is a panel least squares with fixed cross section effects; and the fourth and last one is a panel least squares with random cross section effects. Similarly to Table 2, it was not possible to estimate a panel least squares with period fixed effects and period random effects for the same reasons as those mentioned above.

The coefficients on the lagged dependent variable in the four models are statistically significant with t-statistics between 2.8292 and 4.2962. This shows that this variable should not be omitted from the analysis. The estimates of these coefficients range between 0.10866 and 0.15528. All the adjusted R-Squares are higher than 40%, especially the third model, with fixed cross section effects, that has the highest R-square of 47.63%. Models 2 and 4 in Table 3 produce coefficients that are almost the same. But the standard errors and, by implication, the t-statistics differ. This is in conformity to the results in Table (2). The number of statistically significant coefficients falls after correction for serial correlation. Model 2 and Model 4 have the same significant variables at 3: the net interest spread, the cost to income ratio, and the capital adequacy ratio. Model 3 has 4 variables that enter statistically significantly in the regression. The first three variables are the same as the significant variables for Models 2 and 4, and the fourth additional variable is the non-interest income variable.

Table 3. Panel least squares of the return on average assets (ROAA) on eight exogenous variables

The number of observations is 355, 36 cross sections, and 11 periods (2003-2014)

Regressor	**Model 1**: Panel with Ordinary Least Squares	Model 2: Panel with Ordinary Least Squares	Model 3: Panel with fixed cross section effects	Model 4: Panel with random cross section effects
Constant	1.17009 (4.17465)	1.22828 (4.55577)	0.29238 (0.55043)	**1**.22828 (4.78388)
$(r - r_o)$	0.26737 (4.40095)	0.27149 (4.48911)	0.48093 (4.31540)	0.27149 (4.71388)
δ	-0.02180 (10.4535)	-0.02195 (10.5705)	-0.02488 (7.00927)	-0.02195 (11.0998)
θ	0.00024 (0.14641)	-0.00020 (0.13123)	-0.00022 (0.13474)	-0.00021 (0.13937)
α	0.01384 (4.59392)	0.01413 (4.72915)	0.01156 (2.51491)	0.01413 (4.96594)
β	-0.00154 (0.37364)	-0.00223 (0.55287)	0.00760 (1.51734)	-0.00223 (0.58055)
ϑ	0.00115 (0.64303)	0.00125 (0.70075)	0.00363 (1.59143)	0.00125 (0.73583)
ω	0.00317 (1.40554)	0.00292 (1.30959)	0.00074 (0.24241)	0.00292 (1.37516)
ψ	-0.17706 (1.32102)	-0.17778 (1.32722)	0.56335 (2.56457)	0.17777 (1.39367)
Dummy 2006	0.11785 (0.76521)	-	-	-
ROAA(-1)	0.15252 (3.99833)	0.15528 (4.09131)	0.10866 (2.82922)	0.15528 (4.29616)
Adjusted		0.42255		
R-Squared	0.42185		0.47630	0.42255
Durbin-Watson	2.00741	2.01504	2.40776	2.01504

Note. In parentheses are absolute t-statistics.

A test whether Model 3 in Table 3 has redundant cross section fixed effects is rejected with a Chi-square that has a p-value of 0.0002. Hence, as we found above, there is heterogeneity in commercial banks in Lebanon. Also, a Hausman test for correlated random effects rejects the random cross section specification in favor of the fixed cross section specification, with a p-value lower than 0.00005. Therefore the results support strongly the model with fixed cross section effects, i.e. Model 3.

A dummy variable was generated that takes the value 1 if the bank is an Alpha bank, and zero otherwise. This dummy variable was included as an interactive term with the eight regressors in Table 3. The lagged variable was also included. If the coefficients on these eight interactive terms are jointly statistically significant then this is evidence that Alpha banks and non-Alpha banks behave differently. The null hypothesis that the eight interactive terms are zero fails to be rejected with F-statistics that have the following p-values: 0.3030 (OLS panel), 0.6202 (panel with fixed cross section effects), and 0.2725 (panel with random cross section effects). Hence, Alpha banks and non-Alpha banks behave similarly.

In addition, a dummy variable was generated that takes the value 1 if the bank is a listed bank on the Beirut Stock Exchange, and zero otherwise. This dummy variable was included in the same way as the previous dummy regarding the Alpha banks. The null hypothesis that the eight interactive terms are zero fails to be rejected with F-statistics that have the following p-values: 0.9456 (OLS panel), 0.9806 (panel with fixed cross section effects), and 0.9320 (panel with random cross section effects). As a result, listed and non-listed banks also behave similarly.

Table 4. Long-run effects of the panel least squares of the return on average assets (ROAA) on eight exogenous variables from Table 2

The number of observations is 355, 36 cross sections, and 11 periods (2003-2014)

Regressor	Panel with Ordinary Least Squares	Panel with fixed cross section effects	Panel with random cross section effects
$(r - r_o)$	0.32140 (4.45623)	0.53956 (4.25998)	0.32140 (4.67935)
δ	-0.02598 (10.8956)	-0.02791 (7.00341)	-0.02598 (11.4411)
θ	0.00346 (1.31969)	0.00083 (0.24253)	0.003456 (1.3858)
α	0.01673 (4.46416)	0.01297 (2.43348)	0.01673 (4.68767)
β	-0.00264 (0.55020)	0.00853 (1.53135)	-0.00264 (0.57775)
ϑ	0.00148 (0.69954)	0.00407 (1.58765)	0.00148 (0.73457)
ω	-0.00024 (0.13128)	-0.00025 (0.13479)	-0.00024 (0.13785)
ψ	-0.21045 (1.31775)	0.6320 (2.59089)	-0.21045 (1.38373)

Note. In parentheses are absolute t-statistics.

The coefficient estimates in Table 3 are short-run impacts. The long-run impacts are obtained by dividing the short-run coefficients in Table 3 by 1 minus the coefficient on the lagged dependent variable in the same Table. Hence, if this coefficient is positive and is less than +1, the long-run impacts are higher than the short-run impacts. If this is the case, then economic theory, which predicts that adjustment is faster in the long run, is upheld. This is indeed the case. The long-run multipliers to the short run impacts are respectively 1.1838 (OLS panel), 1.1219 (panel with fixed cross section effects), and 1.1838 (panel with random cross section effects). Notably, the short-run and long-run impacts have necessarily the same signs. Table 4 reproduces these long-run impacts together with their t-statistics for the null that each impact is zero. The statistical significance, as measured by these t-statistics, differs only slightly between Table 3 and Table 4. Of course, the model to adopt, and to base the analysis upon, is the panel least squares with fixed cross section effects, i.e. column 3 of Table 4.

An F-test was carried out on the joint significance of the four variables that were found to be non-significant in the model in column 3 of Table 4. The null hypothesis that all four coefficients on these four variables are zero fails to be rejected with actual p-values of 0.6131 (OLS panel), 0.2903 (panel with fixed cross section effects), and 0.5660 (panel with random cross section effects). Therefore, these four variables can be omitted from the regressions.

Having omitted these four variables the specification with the remaining four variables is estimated by both fixed period and fixed cross section effects. In this case the exact multicollinearity is avoided. The null hypothesis that all period fixed effects are zero fails to be rejected with an F-test that has a p-value of 0.3116. The null hypothesis that all cross section fixed effects are zero is rejected with an F-test that has a p-value of 0.0009. Moreover, the Hausman test for correlated random effects of the specification with random cross section effects, relative to the specification with fixed cross section effects, has a chi-square value with a p-value of less than 0.00005. All these tests point to the same conclusion: the best restricted model is the model with fixed cross section effects. This applies too to the non-restricted model in Table 3, i.e. the one with cross section fixed effects.

Table 5 presents the results of estimating the panel least squares with fixed cross section effects without the four variables that were found to be insignificant in Tables 3 and 4. Since the model includes the lagged dependent variable, the short-run impacts are reproduced in column (2) of Table 5, and the long-run impacts in column (3) of Table 5. The multiplier to the long run is 1.1115, i.e. 1/(1-0.10031), where 0.10031 is the coefficient on the lagged dependent variable. The R-square in Table (5) is 49.192%, higher than its equivalent in Table 3 of 47.630%. Moreover, the Durbin Watson statistic is 2.05524, very close to the perfect value of 2.

The following impacts can be retrieved from Table 5. A 1% increase in the net interest rate spread increases ROAA by 0.6226% in the short run and by 0.6920% in the long run. A one standard deviation increase in the spread, equivalent to 0.966%, will increase the ROAA by 0.668% in the long run. A 10% increase in the cost to income ratio, i.e. from 40% to 50%, will reduce ROAA by around 0.10%. A one standard deviation increase in the cost to income ratio, equivalent to 58.68%, will decrease the ROAA by 0.59%. A 1% increase in CAR will increase ROAA by around 0.01%, or one basis point. A one standard deviation increase in CAR, equivalent to a change of 16.694%, increases the ROAA by 0.1669%. A 1% increase in the non-interest income will increase the ROAA by 0.401% in the short run and by 0.445% in the long run. A one standard deviation increase in the non-interest income, equivalent to 0.4%, will increase the ROAA by 0.18% in the long run.

Table 5. Panel least squares of the return on average assets (ROAA) on four exogenous variables, with the lagged dependent variable

The total number of observations is 404, 38 cross sections, and 11 periods (2003-2014)

Regressor	Panel with fixed cross section effects – short run	Panel with fixed cross section effects – long run
Constant	-0.29714 (1.03913)	-
$(r - r_o)$	0.62258 (6.80227)	0.69199 (6.71342)
δ	-0.00933 (5.55616)	-0.01037 (5.62600)
α	0.00862 (2.24631)	0.00958 (2.17432)
ψ	0.40045 (2.11798)	0.44510 (2.12668)
ROAA(-1)	0.10031 (2.63535)	-
Adjusted R-squared	0.49192	
Durbin-Watson	2.05524	

Note. In parentheses are absolute t-statistics.

In the following section, we are going to evaluate the above results in relation to the theoretical model given by equation (7) and in comparison to the results found in the literature. We will also be identifying some of the peculiar features that characterize Lebanese banking that can help us explain our results.

4. Evaluation of Results

Rigorous estimation and testing have yielded the formulation with fixed cross section effects as the most robust model, rightly indicating the heterogeneity and significant differences among banks in Lebanon. It is interesting that within this model, the dummy variable for the 2006 war was insignificant. This is because the war lasted for one month (July) only, and the banking system was able to overcome with strides this short-run hiccup, as also evidenced by the model's ability for potent long-run adjustments. In this sense, it is persistent political instability, such as the one that the country has been experiencing since 2011, that is testing the banks' performance and their ability to maintain sustained profitability.

Another interesting result is the insignificance of the dummy variables for the large Alpha banks and for the listed banks. The reason behind the insignificance of the Alpha banks is that while they do have higher profits than other smaller banks, the latter do have smaller assets, thus rendering the ROAA for each group of banks fairly the same. As to the insignificance of the listed banks, the reasoning is perhaps a bit more subtle. Listed banks do indulge in decent corporate governance practices and are subject to vigilant shareholders' scrutiny, which should keep banks on "their toes" and induce them to deliver good returns, but the Beirut Stock Exchange is small and rather inefficient, characterized by thin trading and the absence of institutional investors, not to mention the persistence of ownership of voting stocks by the main families (Note 26). As a result, the ROAAs of listed banks seem to be not all that different from unlisted ones.

Also important, of course, are the results concerning the exogenous variables of the model of fixed cross section effects in Table 3. Four of these variables were insignificant: credit risk θ, and the ratio of non-performing loans to capital ω, and each with the right sign; the ratio of liquid assets β, and the ratio of provisions to non-performing loans ϑ, but each with the opposite sign. As to θ, though Lebanese banks can be risk takers with an average risk weight of 57%, almost 11% of their assets are in Lebanese Pound treasury bills which are not subject to risk weights but generate good yields (Note 27). So this tends to neutralize the effect of θ on profitability, and for good reasons. Note that this finding of ours is in disagreement with the positive significant result obtained by Hakim and Neaime (2001) and the negative significant result found by Saad and El-Moussawi (2012). Concerning ω, its insignificance mainly arises from the fact that BdL is always coaxing banks to settle their NPLs so as to maintain a healthier balance sheet, and in the process such measures render its effect on profitability rather negligible (Note 28). In relation to β, its insignificance is the product of two opposing tendencies: on the one hand, it should lead to less interest income and profitability, but on the other hand it should add to more confidence in the banks and hence to more business and profitability (Note 29). And, incidentally, this result conforms to the result obtained by Hakim and Neaime (2011). Lastly, regarding ϑ, the fact that it has an insignificant result is an indication that Lebanese banking - prodded by BdL - seems to engage in dynamic provisioning: given the cyclical nature of credit losses, banks build up provisions in good times to be drawn on in economic downturns as losses increase (Note 30). This tends to weaken the impact of provisions on profitability and render them neutral.

More importantly, we have derived in Table 5 that the fundamental determinants of ROAA in Lebanese banking can be reduced to four significant exogenous variables: net interest margin, capital adequacy, cost-to-income, and non-interest income. All four have the expected sign except for capital adequacy. The net interest margin averages about 2.2%, which is relatively low because of the tough competition among Lebanese banks, but stands to increase in the near future with higher US rates (and perhaps more consolidation in the banking system) (Note 31). As to the capital adequacy ratio, it has an average of 17.7% and its distribution is tilted to the right towards higher ratios. The fact that it exhibits a positive relation with ROAA is quite impressive, indicating that banks reap more returns from holding additional capital than they lose in forgone interest, as reflected in their ability to access capital and deposits at a lower cost and in their potential to extend more and bigger loans. It is also a result that is in harmony with the result in Saad and El-Moussawi (2012). The cost-to-income ratio has the expected negative effect on profitability, but it averages a high 63.4%, driven largely by the cost of a large branch network, higher expenditures on compliance and information technology (IT), and more foreign expansion (Note 32). However, in the medium-tem this ratio is expected to fall as IT starts to substitute for branches and as compliance and expansion costs subside with more maturity. The last variable, non-interest income, reflects the increasing universality of Lebanese banks and their march to become full-service banks. It averages 0.5% and is bound to increase as Lebanese banks diversify more into investment and private banking and into asset and wealth management, and as these latter activities generate higher margins than interest operations. Perhaps more crucially, what these four variables signify is that, when it comes to profitability, what matters most are still the essential aspects that guarantee successful banking in a well-regulated and supervised-system: a good interest margin, an ample capital adequacy, a cost-efficient organization, and a diversified spectrum of activities.

In the next and last section, we will summarize our findings, and reflect on what the results imply for banks and the monetary authorities, in how they should design their strategies and policies to maintain a healthy and profitable Lebanese banking system.

5. Conclusion

Since the new millennium, the Lebanese financial sector's sound contribution to GDP has been steadily maintained at an annual average of 7%. However, the prospects of its relative profitability growth have been dampened by the perils of its geopolitical surroundings. This has in more ways than one battle-hardened the banking sector that has weathered a basket of adverse challenges, both economic and political.

Within this context, the few published papers studying the determinants of profitability in the Lebanese banking sector have been researched on an ad hoc basis by analyzing a mix of bank-specific, macroeconomic, and industry-related variables. This paper adopts a simple yet constrained profit maximization model that regresses the more versatile Return on Average Assets (ROAA) measure against eight exogenous variables: net interest margin, cost to income, credit risk, capital adequacy, liquidity, provisions, non-performing loans, and non-interest income. The estimations are carried across a panel data of 39 commercial banks spanning the period 2003-2014. Out of the three different formulation panels employed, namely the Ordinary Least Squares, Random Cross Section and Fixed Cross Section Effects, the latter proves to be the most prevailing, reflecting heterogeneity among Lebanese banks. Moreover, further evaluation confirms that net interest margin, cost to income, capital adequacy, and non-interest income as the four significant variables determining ROAA, and with the right corresponding signs except for capital adequacy. From a Lebanese banking perspective, the four variables can be rationalized to represent the backbone of profitability. For, net interest margin at an average of 2.2%, remains the bread and butter of commercial banking, with the successful forthcoming increases in interest rate spreads. Equally, efficiently amortizing fixed and IT investment expenses over time is likely to compress the 63.4% average of the cost-to- income ratio and shore up profitability. The "controversial" positive sign of the average of the capital adequacy ratio at 17.7% nullifies the opportunity cost of forgoing interest on excess capital by enabling banks to attract and extend capital at favorable terms. Finally, at 0.5%, the average ratio of non-interest income to assets reflects the direction of undertaking nontraditional Lebanese banking activities relevant to fees and commissions that originate in investment banking, wealth and asset management.

The last point above could perhaps set the course on where Lebanese banks ought to concentrate in generating more alternative profits. Having almost saturated their traditional commercial banking revenue sources, banks in Lebanon need to start nurturing their fee-generating activities by actively developing investment banking, wealth management, and fund-engineering lines of businesses and services. At less than half the emerging markets average of 1.13% in non-interest income to assets, Lebanese banks are presented with an opportunity to capitalize on in these services (Note 33). However, this will require a supportive regulatory environment, which brings to light the role of the regulator and monetary authorities in creating the required framework for such activities. With a market cap-to-GDP of 21% compared to 40% for MENA banks, the local capital market has some way to go. But hopefully with the recent establishment of the Capital Markets Authority, things might be starting to move in the right direction. And certainly, an uptake in M&As within banks and their associated future benefits will lend a helping hand to better rationalization of Lebanese banking activities and to more rigorous capital market developments.

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Notes

Note 1. For more on the performance of banks in post-war Lebanon, see Peters et al. (2004).

Note 2. The corresponding rates for emerging countries are 2% and 17%.

Note 3. At end of 2015, banks in Lebanon had assets of $186 billion, private deposits of $152 billion, capital of $16.7 billion, and loans to the private sector of $54.3 billion, the latter equal to more than 100% of GDP.

Note 4. For instance, during the period 2003-2014, deposits grew at more than 12% between 2003 and 2010 but at only half of that between 2011 and 2014.

Note 5. For a concise literature review on these determinants, see Trujillo-Ponce (2013) and Dietrich and Wanzenried (2009).

Note 6. The relationship with inflation is interesting, since it argues that banks can largely anticipate inflation and adjust their interest rates in a way that increases their lending rates faster than their deposit rates.

Note 7. There is, of course, the "too big to fail" argument, but this also produces an indeterminate effect of bank size on profitability, since on one hand it would require from big banks lower profits but on the other hand it would serve as a catalyst for considerable cost advantages.

Note 8. A similar paper by Salloum and Hayek (2012) find both NIM and ROAA to exhibit the same relations with these variables.

Note 9. Interestingly, they also extend their work to banks' net worth and find it to be determined by the same set of variables in addition to net income.

Note 10. Saad and El-Moussawi (2012) argue that their findings are based on the dealership model of Ho and Saunders (1981), but there is no explicit analytical connection between that model and the regression with internal and external determinants that they estimate.

Note 11. A good example is NIM, where in some formulations it is an endogenous, dependent variable, while in others it is an exogenous, independent variable.

Note 12. For instance, the amended Basel III Accord (after the financial crisis of 2008) gives special significance to liquidity and leverage, besides a renewed emphasis on capital adequacy.

Note 13. The banks are all private: 26 are Lebanese-owned, 5 are Lebanese with Arab control, 4 are Arab banks, and 4 are foreign banks. All these are the commercial banks (out of 54) whose full data are available for the 2003-2014 period. This period is chosen because it corresponds to the "maturing" phase for Lebanese banks after the first and most intensive post-war consolidation of the sector was completed in 2003 – see Mouradian (2016).

Note 14. LIQ is primarily composed of cash, deposits at the Central Bank, and deposits at international banks; I is mostly composed of investments in treasury bills and government Eurobonds; and L is loans to the private sector.

Note 15. More than 80% of liabilities at Lebanese banks are made up of private deposits.

Note 16. NII is usually comprised of net fees and commissions, net income on foreign exchange, and net gain/loss on financial assets or investments. We will include only net fees and commissions in our model since it reflects true diversification into fee-generating activities like asset management and private and investment banking.

Note 17. Of this "mandated" liquidity, banks are required to maintain at BdL 10% of their foreign currency deposits in liquid assets and 15% as remunerated foreign currency deposits.

Note 18. This coverage ratio excludes real guarantees and collaterals.

Note 19. It is also evidenced by BdL's frequent calls on banks to settle their NPL and to avoid carrying excessive doubtful loans against their capital.

Note 20. The constrained maximization equation is as follows: $\prod = (r - ro)(A - C) + NII - (r - ro) LIQ - (P^* - P) - \delta \{(r - ro)(A - C) + NII - (r - ro) LIQ - (P^* - P)\} + \lambda_1(C/\theta A - \alpha) + \lambda_2(LIQ/A - \beta) + \lambda_3(P^*/NPL - \vartheta) + \lambda_4(\omega - NPL/C) + \lambda_5(NII/A - \psi)$, where λ_1-λ_5 are the respective Lagrange multipliers for the five constraints.

Note 21. For more on this point, see Flamini et al (2009).

Note 22. Such measures were invariably like the ratios of loans to deposits or of loan-loss provisions to total loans.

Note 23. BdL's preference is for higher equity to assets ratios, notably in excess of 8%.

Note 24. All data were compiled from Bankdata (Various Years).

Note 25. Note that the descriptive statistics for the capital adequacy ratio relate to Basel II figures, whereas the minimum of 12% discussed earlier relates to (the much tougher) Basel III and was set by BdL for 2015.

Note 26. See Shareholders Rights (2015).

Note 27. Another 10% of assets are held in Lebanese Eurobonds, which are subject to risk weights, making total bank holdings of government debt equal to 21% of assets or close to 55% of government debt.

Note 28. In effect, NPLs as a ratio of total loans declined during the studied period 2003-2014 from more than 8% to 3.5%.

Note 29. Not to mention that liquidity parked at BdL earned in 2015 an average of 2.78% for US$ deposits and 2.92% for Lebanese Pound deposits

Note 30. Close to the system adopted in Spain – see Trujillo-Ponce (2013).

Note 31. The Hirschman-Hilfendahl Index (HHI) for concentration of Lebanese banking assets can be calculated as 724, less than 1,000, thus indicating a competitive market.

Note 32. For instance, in 2015 there was close to 1,100 branches in the country, or a branch for each 4,000 individuals, one of the highest ratios in emerging countries. There are additionally 17 Lebanese banks present in 31 foreign countries with a branch network exceeding 400 branches.

Note 33. As per footnote 16, the ratio of non-interest income to assets is confined to the fees and commissions component of non-interest income.

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Monetary Policy and Financial Stability: A CEMAC Zone Case Study

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Abstract

This article scrutinizes the relation between the monetary policy and the financial stability driving data from CEMAC zone countries. Furthermore, it aims to know if in addition to its mandate about price stability, the BEAC bank integrates the financial stability in its monetary policy. My method is based on the Taylor Increased Rule estimation of the financial price assets and the econometric test. The results show that the separated policy-mix better fits for CEMAC zone countries. Furthermore, it comes out that the adapted monetary policy practiced by BEAC bank currently ensures the price stability.

Keywords: policy-mix, monetary policy, the Taylor increased rule, macro prudential policy, price and financial stability

1. Introduction

This paper aims to answer the question whether the financial stability is correlated to the price stability. The financial crisis in 2007 in USA had demonstrated that the financial instability was not the main phenomenon that solely affect emerging economies likely to face economic policy errors or speculative attacks of foreign investors (Cartapanis, 2011). This crisis that the USA financial system, which is viewed as the most reliable, encountered demonstrated that the complex factors leading to a financial instability. It has contributed to the profound revision of most existing financial and bank governance systems with a particular attention to the role of central banks and the relation between monetary and financial stability. In fact, the insight from this financial crisis insistently raises the issue whether, based on the current context of economic globalization, it is not possible to add the financial stability as another objective to the monetary stability within the core responsibility of central banks.

In contrast to monetary stability, which is easily definable and quantifiable, financial stability is a complex concept, hard to grasp and has not yet got a granted definition (Gill Hammond, 2007). It depends on microprudential policy which is concerned on the one hand by the microprudential, which deals with the prevention of individual bank difficulties and on the other hand macroeconomic and monetary stability objectives.

The financial stability can also be accounted by in terms of the financial system instability absence in a whole (Note 1). It is not synonymous to the elimination of the market volatility, but rather by the premonition against an excessive volatility of the asset price on the one hand, and against an excessive expansion of the credit on the other hand.

The financial stability can also become an important factor for the economic growth; the relation between the monetary policy and the financial stability remains a priority either for theoretical or applied research along these decades.

Firstly, on the theoretical ground, the debate on the monetary policy is focused on the relation between inflation and economic activity. The question related to financial stability or instability has been given the second position. In fact, till the crisis, the consensus guiding central bank actions since 1990 was based on the hypothesis that monetary stability was a relevant and sufficient condition for financial stability. Otherwise, the monetary stability necessarily conducted to the financial stability and sustainable economic growth.

This hypothesis was worthy in 1999-2000 known as "Great moderation" period characterized by a low and stable inflation around 2% amongst G7 countries in contrast to inflationist tensions from 1990 to 2000. Yet, the start of the crisis in 2007 has shown that the monetary stability from 1990 to 2000 was prejudicial to financial stability since it has incited economic actors, and particularly banks, to take more risks which lead to the crisis (Borio et al., 2012): it is the credibility paradox. It follows that the mere relation which consisted in claiming that monetary stability is a relevant and sufficient condition to financial stability does not hold. The inflation is not a good indicator to predict a financial crisis (Note 2) and the financial stability becomes a relevant condition to economic growth (Note 3). In this connection, the macroprudential tool looks like an instrument dedicated to fight financial instability, hence the relation between the financial stability and monetary stability gets its climax position either in theoretical or applied research.

Two approaches current raise the debate on the orientation policy clean vs lean monetary policy in front of macroprudential policy: separated policy mix and integrated policy mixed.

The former advocates the separation between monetary policy and macro-prudential policy, each being under the supervision of specific and distinct bodies, one of which is in charge of monetary stability and the other in charge of financial stability (Svensson, 2012, Bernanke, 2010, 2012). According to Tinbergen's rule and Mundell Principle, the separated policy mix asserts that monetary policy depends totally on monetary stability and macroprudential policy on financial stability. The central bank is more implied in the supervision of financial establishments.

The latter approach postulates an integration of the monetary policy and macroprudential policy. One or the other should be ruled by the same body for a better organization between respective objectives (Adrian & Shin, 2009; Mishkin, 2011; Eichengreen et al., 2011). The monetary and financial stability will be integrated in the same Augmented Taylor Rule. It is about the extension of Taylor Rule in order to include a financial variable such as the credit (Christiano et al, 2010), monetary supply (Issing, 2011) or financial imperfection indicators (Wooford & Curdia, 2009) (Note 4). However, this approach shows some limitations in connection to the implementation of the rule elaborated by Tinbergen in 1952. Thus, the interest rate cannot alone achieve three objectives: monetary stability, macroconjectural stability, and financial stability.

Intermediary solutions between the two approaches are possible (Note 5). In the light of Beau et al. (2011), the optimal policy mix solely depends on the type of shock, the crossing conditions regarding inflation and financial stability. So, for some central bankers, the integrated system represents an emergency solution, but should only be used if it is "the only possible solution" in case of extreme crisis. Under these exceptional conditions, Bernanke (2012) does not exclude to resort to the interest rate to fight financial instability. Yet, uncoupled policy mix suits under normal circumstances. The choice of policy mix is not simply a theoretical issue, it is rather empirical because it varies according to macroeconomic conditions.

In fact, under empirical view, the general dynamic equilibrium models and stochastic are the main macro conjectural modeling tools issued from macroeconomic theory since the beginning of 2000s. They start integrating financial frictions that they ever integrated before the crisis. The most current integrate the action of macroprudential policy in addition to that of monetary policy.

A number of authors even go further in combining one or more macroprudential tools with one Augmented Taylor Rule for a given financial target, and hence permitting the articulation of the interest rate and the macroprudential tools to restore financial stability.

Moreover, under methodological perspective, the diversity of model is important. Some models standardize reply coefficients of Taylor Rule when the others optimize them. Even when the reply coefficients of Taylor Rule result from optimization, methods are different. The optimization can concern inflation change and production. Or one can have recourse to one function of ad hoc loss of the central bank with or without financial stability as a support argument.

It is thus difficult based on the results of the previous conclusions to hypothesize whether the central banks should take or should not take into account macroprudential policy for their rate regulation. As things stand, it is obvious that a policy that enables to face the accumulation of financial disequilibria is not appropriate and it is not enough that monetary policy responsible try to eradicate macroeconomic consequences during bear phase.

The question that immediately crops out is to know if in the future the monetary policy will more contribute to maintain the financial stability and eventually gets an important role.

So, this is the proven interest of carrying out a study dealing with the relation between monetary policy and financial stability. Furthermore, if we take for granted the hypothesis which is widespread in the literature that macroprudential policy is an essential condition for financial stability, it is worth examining how such a concern is observed in CEMAC (Note 6) zone in view of the importance of the direct and indirect channels through which the asset prices affect the economic agent behaviours and the whole economy.

In fact, in CEMAC zone countries, a distinct bank commission shares the bank regulation with BEAC bank, but the global prudential responsibility depends on CEMAC zone council of Ministers. However, other regional entities are in charge of the regulation of non-bank financial establishments of the zone.

Since the macroprudential responsibility is shared, the question raises is whether in addition to its role for financial stability, BEAC bank integrates financial stability in its governance of monetary stability.

The remaining work includes two sections and a concluding remark. Second 2 is about the determination of the model of reaction function of the central bank; the estimation and the analysis of the key results is the concern of section 3.

2. Determination Model for BEAC Reaction Function

This section is devoted to provide an overview of the theoretical framework worthy for the analysis before providing specificity of the model for estimation purpose.

2.1 Presentation of the Model

Starting from the hypothesis that the macroprudential policy should stand as an essential tool in the future for the financial stability in CEMAC zone, we purport to provide a method capable of modelling a reaction function for monetary authorities that can include one or more types of macroprudential policies.

Considering, under this perspective Angeloni and Faia (2013), Kannan et al. (2012) and IMF (2012, 2013), a general dynamic equilibrium model and stochastic, which is, as stated so far, the main tool of macroprudential modelling issued from macroeconomic theory.

The advantage of this model is that it enables to incorporate macroprudential rules used to limit financial fluctuations and to represent monetary policy by means of a Taylor Rule which can make reply the interest rate either to fluctuation gaps, production gap and financial gap.

This model is also advantageous as it represents several types of mix policies: separated mix policy according to which monetary policy does not correspond to financial conditions and it centers on the stability of inflation and production, and integrated policy mix which admits that monetary policy cooperate with macroprudential policy and backs it up to respond to financial instability.

The response coefficient value to financial condition under the Taylor Rule that this model uses seems to be the variable that better represents the point of articulation between monetary policy and macroprudential policy in the search for financial stability.

It is then fortunate to explain the differences of the coefficient value and policy mix nature indeed. The function of reaction looks like an Augmented Taylor Rule whose loss function is given the following schema:

$$£ = E_t(y_t - y^* - \mu_t)^2 + \alpha(\pi_t - \pi^*)^2 + \beta(\rho_t - \rho^*)^2 \tag{1}$$

Where in:

- E_t, the expectancy at time t of the loss;
- y_t, refers to effective growth rate at time t (y^* is the potential production rate);
- πt, stands for the inflation rate at time t (is the token target value by the central banker);
- pt, is the financial stability level at time t and p* its optimal level;
- µt, the different type of shocks that affect an economic activity.

The equation (1) formalizes the response of the nominal interest rate of the central bank with three gaps: an inflation gap, a production gap and a financial gap.

2.2 Specification of the Model

It is worth claiming that a financial gap is very complex as it can refer to credit spread, the price of real estate, the price of actions, credit growth rate, or money supply (we can also find synthetic financial indicators).

The inflation, production and financial gap response coefficients are β, γ, δ respectively. These coefficients show the intensity of the central bank response and are on top of economy structure (for example inflation/production arbitration) and the central bank preferences represented in its loss function. In this perspective, more the response to the interest rate to financial condition is higher, more the policy mix becomes integrated; conversely when the response is low so the policy mix is separated. The monetary rule specific to this type is as follows:

$$i_t = \alpha_0 + \beta X_t + \gamma(\pi_t - \pi^*)_t + \delta(\rho_t - \rho^*)_t + \mu_t \quad (2)$$

Where in:

- i_t is the central interest rate dictated by monetary authorities at time t;

- X_t refers to output gap or production gap at time t;

- $(\pi_t-\pi^*)$ refers to a gap at time t between the inflation rate and the target established by monetary authorities;

- $(\rho_t - \rho^*)_t$ represents a gap at time t between financial value (pt) and their value being fundamental (p*);

- μ_t represents error term.

This specification is advantageous as mentioned above because it permits to:

1/- draw a conclusion from policy mix modalities between monetary policy and macroprudential policy;

2/- distinguish between two cases of polarity: a separated policy mix wherein monetary policy remains concentrated on the financial stability and macro-conjectural policy whereas macro prudential policy aims to financial stability in adjusting the central rate concerning financial conditions.

Moreover, we put forward the hypothesis that BEAC is incapable of distinguishing movements in accordance with fundamentals to those which are not.

Following Wooford (2012), one can admit that there is arbitration of BEAC monetary authorities between macroeconomic stability (inflation, production) and financial stability. The response coefficients will depend on BEAC preferences in its loss function. For IFM (2013), it is a commonly argued that for a central bank to think of financial stability affects its anti-inflationist credibility. Three types of constraints are distinguished indeed:

1- γ must be negative, we expect a negative relation between γ and δ, hence a separate policy-mix due to the objective conflict prejudicial to the central bank credibility in relation to the price stability. Formally, we expect a negative sign for the explanatory variable γ.

2- The expected sign for β variable, i.e. the production, is less obvious. Due to the objective conflict, we can expect a negative sign. Yet, if the central bank is more 'Dove' (high preference for the production and employment and the financial stability by extension) than 'falcon' (strong anti-inflationist preference), he will likely care about the production and look more open to other objectives than inflation. In this perspective, he can also be open to financial objective as a final objective. The expected sign in front of β is ambiguous.

3- The financial gap response coefficient value (δ) is representative to the articulation between monetary policy and macroprudential policy. If the coefficient value is significant, the monetary policy cares about the financial stability. The policy-mix is thus integrated. However, if the coefficient value is not significant, BEAC bank cares less about the financial stability. In this respect, the macroprudential policy is affected by the financial stability objective. The ensuing section is devoted to the estimation of the model as well as its analysis.

3. Estimation of the Model and Analysis of the Main Results

We are firstly going to estimate the model through equation 2 before undertaking the analysis of the main major results.

3.1 The Model Estimation

The model estimation requires a prior choice of the different variables of the model. This mainly concerns the choice of the interest rate measure, inflation rate, and financial and production gap. In fact, this study drives data from BEAC database. These are annual database and cover 1980-2013 (Note 7) period.

a) The analysis of the model variable

Firstly, the interest rate is nothing but the central bank refinancing rate for an annual change period. Figure 1 below illustrates the evolution of this variable through time.

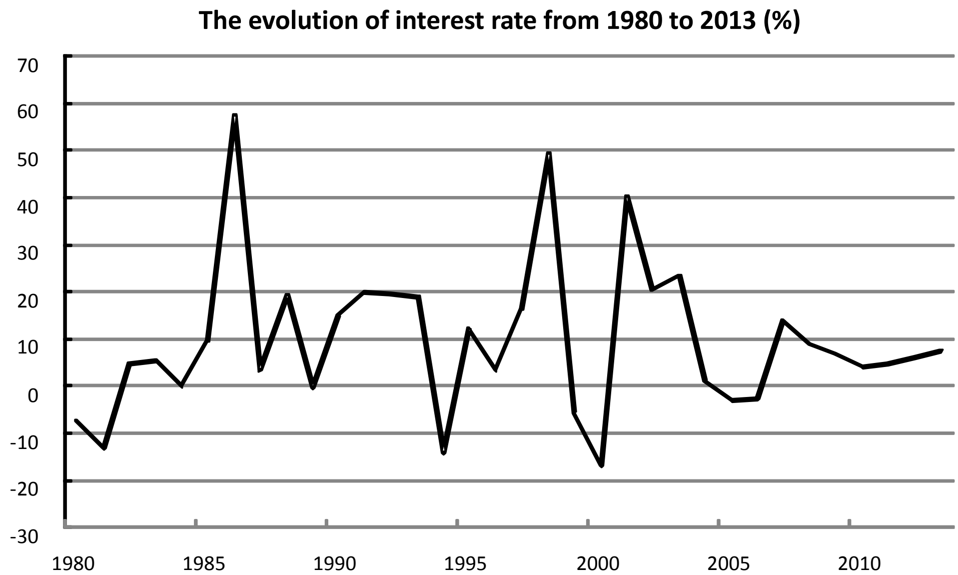


Figure 1. The evolution of interest rate from 1980 to 2013 (%)

Secondly, the inflation rate is the consumer price index growth rate (IPC) during a year provided by BEAC. Figure 2 shows this variable.

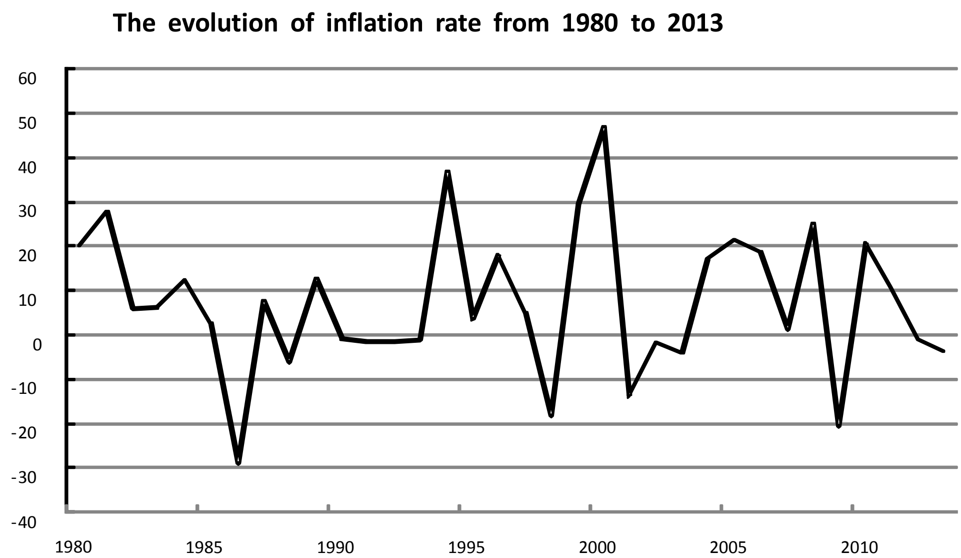


Figure 2. The evolution of inflation rate from 1980 to 2013 (%)

Thirdly, the output gap measure, the effective rate marked y_t represents a growth computed from volume index of a real GDP taken from BEAC statistics. We have specifically used In (GDP_t/GDP^*) whereof GDP* is a potential GDP. Potential GDP data have been elaborated following Hodrick-Prescott filter application (Note 8). This approach is worth considering because it provides a statistic estimation framework compatible with a central bank real time analysis. Chart 3 hereafter provide a synthetic overview of this variable for 1980-2013 period.

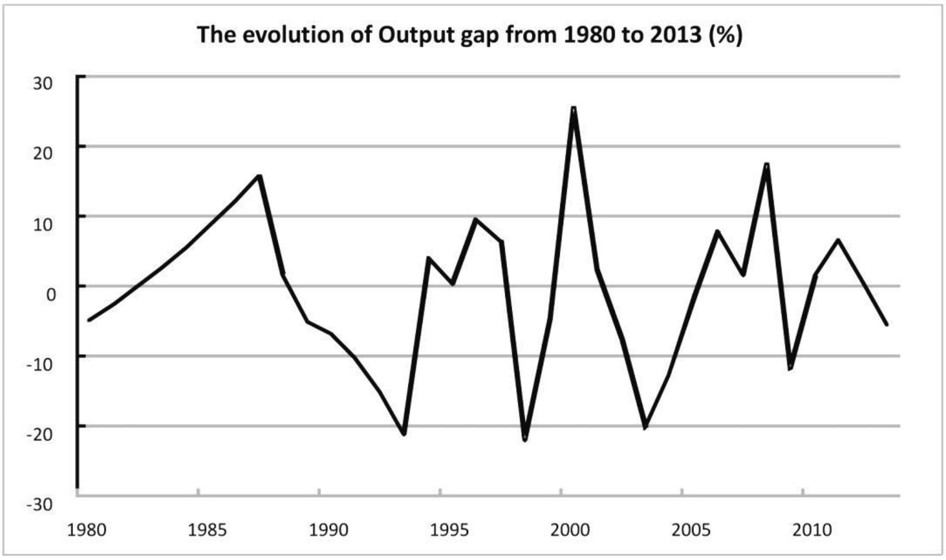


Figure 3. The evolution of output gap from 1980 to 2013 (%)

Finally, to get macroprudential value, we hypothesize that in CEMAC zone, financial assets are essentially made of cash. Money is a financial asset whose holding depends on its price in connection to other assets. A rise of the interest rate can lead agents to orientate their cash towards a non-monetary investment which is more profitable.

Based on thee bank system and the underdevelopment of money markets, we have selected “proxy” as our value for financial stability, money supply (M2). Statistic data taken as fundamental for this financial variable have been formulated based on Hodrick-Prescott filter. It can be determined as an evaluation error on the financial market index in relation to theoretical price, that is to say, according to the difference between its effective value and potential value established in percentage of the potential value or by logarithmic version In (pt/p*) used afterward.

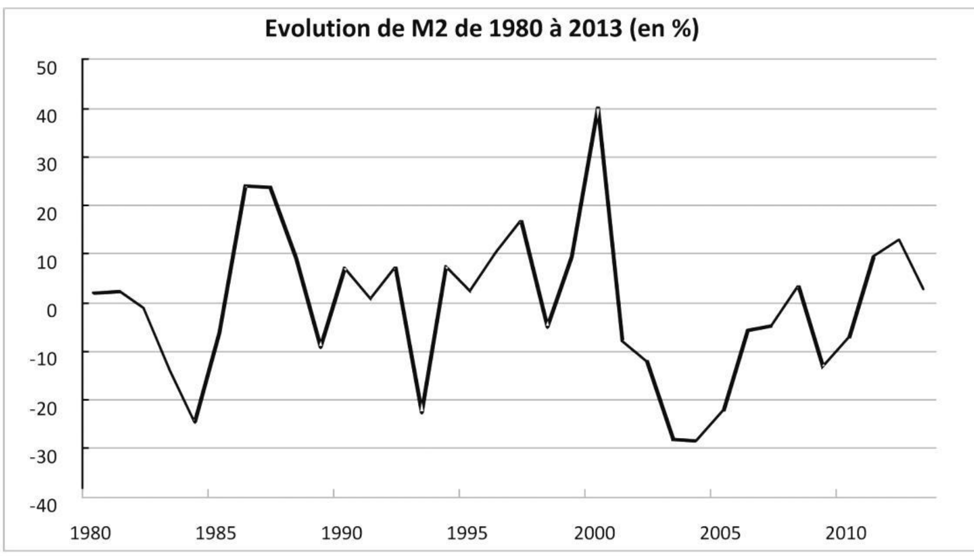


Figure 4. Evolution de M2 de 1980 à 2013 (en %)

b) Estimated model

We have firstly proceeded by Dickey-Fuller Augmented test (ADF) in order to test the existence of a unit root, that is, the average of non-stationary tested variables and determine their hierarchy in analysis. Table 1 below points out the major results.

Table 1. Dickey-Fuller Augment test results

Series	Specification	Delay(s)	Statistics	Critical values	Conclusion
i_t	with C, no T	1	-5,04	-3,65	I(0)
X_t	no C, nor T	1	-4,13	-2,64	I(0)
π_t- $\pi *$	with C, no T	1	-4,90	-3,65	I(0)
ρ_t- $\rho *$	no C, nor T	1	-3,51	-2,64	I(0)

It transpires from the test that the estimated values of Dickey-Fuller Augmented (ADF) statistics are generally low to the critical values at significance level 1%. Consequently, we reject the null unit root hypothesis in favour of alternative variable stationarity hypothesis. It comes out that all variables are stationary. It is thus pointless to characterize one or more cointegration relation. Let's look at identification strategy in the upcoming lines.

Owing to the intermingled link between the interest rate and macroeconomic variables taken as explanatory variables, we could possibly be in front of reverse causality, and hence endogeneity bias. In order to scrutinize this potential problem, we make use of Granger causality test, the results of which are formulated in Table 2 below.

Table 2. Granger test results

Tested hypotheses	F-statistics (p-value)	Conclusion
Interest rate does not determine output-gap	0,07 (0,93)	Acceptation
Interest rate does not determine inflation	0,34 (0,72)	Acceptation
Interest rate does not determine money supply	0,39 (0,68)	Acceptation

The results issued from Granger Test come to the conclusion that the three hypotheses are well accepted. Indeed, there is probably no reverse causality in the model, and hence no endogeneity bias. The upcoming section highlights the major results of the estimation.

3.2 Major Results of the Estimation

Based on Eviews 7 software, the results of estimation (cf. annexes) appear as follows (Note 9):

$$i_t = 15{,}90 + 2{,}08X_t - 0{,}87(\pi_t - \pi_t^*) + 9{,}61(\rho_t - \rho_t^*)$$

$$(6{,}95) \quad (0{,}10) \quad (6{,}37) \qquad\qquad (0{,}94)$$

N = 34;

R^2 adjusted: 0,71;

Heteroskedasticity correction: White;

% Q = 100;

JB (p-value) =0,12.

Under econometric diagnostic level, results are robust to heteroskedasticity by White method application. %Q indicator proves that there is no fraction auto-correlation, and thence to no delay. Finally, Jarque-Bera test confirms a normal fraction.

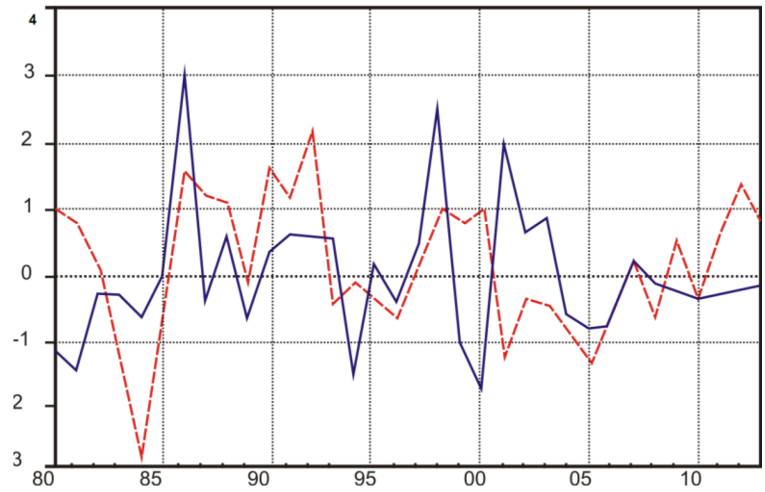
Generally speaking, the processed tests on the model promote the validation of the model to represent the interest rate dynamics. In broad sense, two hypotheses can be formulated:

1) Separated policy mix practice in CEMAC zone;
2) An adapted monetary policy rule practice.

3.2.1 Separated Policy Mix Practice

It appears that the coefficient associated to asset price variability is low, that is, non-significant. This means that the selected macroprudential tool (money supply) directly constrains borrowers and further reduces the response of monetary policy to financial stability. It is thus less in favour of integrated policy mix wherein monetary policy responds to financial instability in order to support macroprudential policy for financial stability.

It follows that financial stability is not an intermediary objective to BEAC as Figure 5 below illustrated.



(---: macroprudential variable, __: interest rate)

Figure 5. The evolution of the central rate and financial asset prices

It results from Figure 5 that BEAC does not take into account financial asset price because the two series (interest rate and asset price) are not procyclical. This clearly demonstrates that monetary authorities of CEMAC zone are less likely to change their strategy to incorporate a new financial stability objective. Thus, it is doubtless that they will prefer to keep their traditional consensus of separated policy mix instead of integrated policy mix. This confirms the principle that the central rate is independent of the evolution of financial asset price. Since the symbol γ is negative, taking into account a new financial stability objective leads to a conflict of objectives which is prejudicial to the credibility of BEAC bank in terms of price stability. As BEAC grants great interest on inflation and engages its credibility in order to achieve its price stability, more it is reluctant to pay attention to financial stability. In this respect, the financial stability must be under macroprudential policy. This leads to the adoption of the separated policy mix in CEMAC zone.

The Implementation of the separate policy mix requires the BEAC bank to adopt an efficient supervision system. This will imply BEAC bank to extend its supervision on banks as well as other intermediary financial establishments, i.e. non-bank financial establishments.

3.2.2 An Adapted Monetary Policy Rule Practice

Like the standard Taylor Rule, the monetary policy is optimal if it minimizes the inflation and production gaps. As the coefficient γ is negative, this presupposes that the inflation target in CEMAC zone is above the current inflation. In this respect, the BEAC bank authorities are obliged to maintain the short term base rate interest at a low level in order to bring the current inflation up to its target level.

Moreover, the non-significant output gap response coefficient does not seem to influence policy mix in CEMAC zone. Under these conditions, BEAC bank is more concerned with inflation and is not open to other objectives. Economic test results advocate an adapted monetary policy rule with a unique objective related to goods and service price stability. Put otherwise, as the interest rate is the adjustment variable which allows to stabilize inflation to its low level in the CEMAC zone leads to the implementation of an adapted monetary policy.

By maintaining interest rate to its low level, monetary policy can stimulate demand, but under the current circumstances in CEMAC zone, the efficiency of the decrease of credit rate for consumption stimulation and private investments solely depends on the good working of the channel for bank credit. Marginal advantages of supplementary stimulus are larger when banks are ready to increase credit availability in adjusting credit allocation in accordance with monetary condition loosening when credit procedures are not loosened.

Yet, it is obvious that institutional organizations in CEMAC zone are more and more facing prudential norms which do not prompt them to allocate credits (Engone, 2014).

4. Conclusion

This paper has examined the link between the monetary policy and financial stability in CEMAC zone. It has checked if the financial stability management in the CEMAC zone is integrated in the monetary policy governance. In this connection, a BEAC bank reaction function is estimated in integrating not only an inflation and a growth gap, but also a financial stability variable.

So it appears that an integrated policy-mix is rejected in CEMAC zone in favor of a separated policy mix. In fact, the macroprudential policy becomes the only suitable instrument to ensure financial stability in CEMAC zone.

Finally, the interest rate being an adjustment variable to stabilize inflation at a low level in CEMAC zone countries leads to the adoption of an adapted monetary policy in view of bringing the current inflation up to the level of the inflation target; what will reinforce the BEAC bank credibility

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Notes

Note 1. In contrary to microprudential approach which is interested in each firm but individually.

Note 2. So, the financial stability cannot be considered as a secondary objective because the crisis has demonstrated that the search for the price stability was an important condition, but insufficient to guarantee financial stability. Accordingly, the correlation between the two objectives, financial stability and monetary stability becomes an insightful question.

Note 3. The credibility paradox is similar to the tranquility paradox (Hyman Minsky, 1980) according to which the excessive debt crisis is settled down when everything is good because the economic agents take the advantage of the growth and the interest rate to borrow more. Yet, an interest rate turnaround further to a monetary policy tightening renders a sustainable debt unsustainable.

Note 4. The hypothesis appealing to broaden the definition of inflation measure in order to include some asset prices is relevant (Alchian & Klein, 1973; Shibuya, 1992). Augmented Taylor Rule means that monetary policy is oriented “lean” to defend macroprudential tool; interest rate and macroprudential tools are supposed to have complementary actions.

Note 5. It concerns conditional policy mix or intermediary approach which is formulated in terms of Asymmetric Taylor Rule or non linear sometimes non augmented with a response coefficient on stability changing over time.

Note 6. CEMAC (Economic and Monetary Community of Central Africa) includes six countries: Cameroun, Congo, Gabon, Central African Republic, Equatorial Guinea, and Chad. These countries have a common central bank, Bank of Central African States (BEAC).

Note 7. The choice of the period and sampling period depended on data availability. In fact, infra annual data were unavailable.

Note 8. The filter elaborated by Hodrick and Prescott (HP filter) has been applied in many surveys to evaluate potential production (Fisher et al., 1996, Turner, 1995). We have applied a 100 smoothing parameter, a value which is generally used for annual data.

Note 9. Student statistics appear between brackets. % Q is an indicator which summarizes the conclusion of Ljung-Box test on fraction autocorrelation to all delays. It particularly provides delays for which the autocorrelation absence hypothesis is approved. For example, if % Q=100, this stands for 100% of cases, so the autocorrelation absence hypothesis is approved. The selection of this indicator avoids to choose a specific delay that should conduct to the approval of Ljung-Box test. Moreover, Jarque-Bora p-value test is reported. The tested hypothesis is that fraction distribution is normal. A p-value above 0.05 leads to the approval of the tested hypothesis.

Appendix

Abbreviations:

TIR = Interest rate

X = output-gap

INF = inflation rate

P = M2 potential growth

Granger Tests:

Granger Test of interest rate / output-gap

Pairwise Granger Causality Tests
Date: 09/08/15 Time: 11:02
Sample: 1 34
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
X does not Granger Cause TIR	32	3.69200	0.03825
TIR does not Granger Cause X		0.07020	0.93238

Granger Test of interest rate / inflation rate

Pairwise Granger Causality Tests
Date: 09/08/15 Time: 11:04
Sample: 1 34
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
INF does not Granger Cause TIR	32	0.15962	0.85326
TIR does not Granger Cause INF		0.33629	0.71737

Granger Test of interest rate / money supply

Pairwise Granger Causality Tests
Date: 09/08/15 Time: 11:05
Sample: 1 34
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
P does not Granger Cause TIR	32	2.52026	0.09919
TIR does not Granger Cause P2		0.38772	0.68232

Conclusion:

Hypothesis A in every table: we reject tested hypothesis for X, we accept that of INF and accept bound to P. This provides an indication for the final estimation: we can expect X to be significant, P is slightly significant or slightly non-significant, and INF is non-significant.

Hypothesis B in every table: we accept the tested hypothesis for all cases. This presupposes that there is no reverse causality for none variables. There is no endogeneity to deal with.

Estimations:

1) No correction with White

Dependent Variable: TIR
Method: Least Squares
Date: 09/08/15 Time: 12:01
Sample: 1 34
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.89905	1.690597	9.404400	0.0000
X	2.075009	19.18822	0.108140	0.9146
INF	-0.868615	0.102839	-8.446327	0.0000
P	9.605676	12.51075	0.767794	0.4486

R-squared	0.737294	Mean dependent var	9.567059
Adjusted R-squared	0.711023	S.D. dependent var	16.19935
S.E. of regression	8.708217	Akaike info criterion	7.276542
Sum squared resid	2274.992	Schwarz criterion	7.456114
Log likelihood	-119.7012	F-statistic	28.06531
Durbin-Watson stat	2.014967	Prob(F-statistic)	0.000000

Q = 100 %
JB (p-value) = 0.12

2) With correction by White:

Dependent Variable: TIR
Method: Least Squares
Date: 09/08/15 Time: 12:03
Sample: 1 34
Included observations: 34
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.89905	2.287690	6.949828	0.0000
X	2.075009	20.84045	0.099566	0.9214
INF	-0.868615	0.136272	-6.374121	0.0000
P	9.605676	10.17524	0.944024	0.3527

R-squared	0.737294	Mean dependent var	9.567059
Adjusted R-squared	0.711023	S.D. dependent var	16.19935
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Q = 100 %

JB (p-value) = 0.12

The tests prove that there is no need to correct fraction autocorrelation.

The tests show normal fractions, and hence the processing of tools is not relevant.

The correlations between explanatory variables (see below) show an above correlation between X and P which could lead to multicollinearity. However, to exclude P does not change anything to X, and vice-versa.

	INF	X	P1	P2
INF	1.000000	0.416804	-0.197958	0.174831
X	0.416804	1.000000	-0.102925	0.609100
P	0.174831	0.609100	0.664055	1.000000

Series are stationary indeed and does not require any processing.

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A Study of the Determinants of Cost and Revenue Efficiency in the Context of Islamic and Conventional Banks: The Case of Malaysia from 2006 to 2012

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Abstract

In this paper, we examine the determinants of cost and revenue efficiency of Malaysian banks over the period 2006-2012. Three steps are undertaken to study a sample of 17 Islamic banks (IBs) and 20 conventional banks (CBs). In the first step, we assessed the competitiveness of the Malaysian banking sector. After solving the multicollinearity problem, as a second step, we selected three sets of independent variables: bank-specific, industry-specific and macroeconomic variables. In the last step, we estimated the efficiency models with the Feasible Generalized Least Squares (FGLS) method. The obtained results highlighted the importance of regulatory capital and size. As for the effect of competitiveness, it is found to be statistically significant only for revenue efficiency. These results may be useful to political decision-makers and regulatory authorities.

Keywords: Islamic banks, conventional banks, cost and revenue efficiency, meta-frontier analysis, capital, market competitiveness, credit and liquidity risk

1. Introduction

The success of the Malaysian banking system in surviving the "subprime" crisis with the least damage reflects the significance of the different monetary policies adopted by policymakers and supervisory authorities since the 1997 Asian crisis. Developing Islamic financial intermediation is part of these policies.

Indeed, today Malaysia is considered among the leaders of Islamic finance. Its prominent position resulted from the political choices undertaken by the successive cabinets of Mahathir Mohamed. It was in 1980 that the decision to support Islamic finance in Malaysia has become political. This date marks the event of adopting the "Islamic Banking Act" which provides a legal framework for the creation of IBs. The new practice of Islamic finance in Malaysia was initiated as an experiment that lasted ten years in which one bank was created; it was the "Bank Islam Malaysia Berhad". Following this period, the door was open for a rapid development of Islamic finance. In 1993, the government launched the "Interest Free Banking Schema" authorizing CBs to open "Islamic windows" benefitting from management and accounting practices that are independent of those of CBs. In 2004, the government decided, as part of a strategy to liberalize the banking sector, to grant new licenses for foreign IBs mainly from the Gulf countries. As a result, the number of IBs in 2012 reached sixteen banks in addition to ten Islamic windows (Note 1).

As part of its regulatory role, in 1997 the Bank Negara Malaysia (BNM) created, the Shariah Advisory Council whose role is to ensure that the financial products held or newly conceived by Islamic financial institutions comply with the Sharia principles. In addition, the Malaysian capital (Kuala Lumpur) was chosen to host the headquarters of two international organizations monitoring the stability and solidity of the various Islamic financial institutions. These organizations are the "International Islamic Liquidity Management Corporation", created in late 2010 to manage cross-border liquidity, and the Islamic Financial Services Board (IFSB) established in 2003 as the official international body supervising the Islamic economic sphere. Malaysia has also managed, through a more flexible interpretation of Sharia requirements, to create in 1994 an Islamic Interbank Money Market and to design various Shariah-compliant instruments. Among these instruments are the "Mudharabah interbank investment", the "Bank Negara Negotiable Notes" and "Islamic Treasury Bills" issued by BNM and "Government Investment Issues" issued by the Malaysian state. Malaysia has, moreover, is ranked globally first in terms of issuing sukuks. Indeed, despite the disruption of the world economy due to the recent financial crisis, Malaysia has continued to be a key participant in the global sukuk market with a 74% issue rate in 2012 (71,6% in 2011) of the total sukuks emissions, ahead of Saudi Arabia with only 8% of total emissions. It was also one of the biggest beneficiaries of sukuks denominated in US dollars (19% of total emissions worldwide in 2012) (Note 2).

In addition to developing activities of IBs, Malaysian supervisory authorities insisted on the promotion of risk management policies and on IBs and CBs detaining a sufficient level of capital. The Financial stability and payment systems report, published by the BNM in 2007, indicates that the five largest banking groups have seen an increase in capital since 2007 (Note 3). In addition, the beginning of 2008 was marked by the entry into force of the Basel II Accord requiring Malaysian banks to adopt the different approaches defined by the Basel Committee for Risk Assessment. The application of this device by IBs complies with the relevant recommendations of the IFSB.

In this paper, we intend to examine the changes undergone by the Malaysian banking system so as to study their influence on cost and revenue efficiency over the 2006 to 2012 period. In particular, we focus on the effect of change in market structure, regulatory capital and size. This paper is organized into five sections. The literature review and our hypotheses are presented in section 1. The methodology is presented in section 2. Section 3 describes the data. The results are presented and discussed in section 4. The last section concludes the paper.

2. Literature Review and Hypotheses

2.1 Literature Review

Analysis of the determinants of efficiency is made by means of the following: risk, capital, size, and market competitiveness. The relationship with risk has led to different results. Gorton and Rosen (1995) explain the positive relationship between efficiency and risk by the hypothesis that rooted managers in an efficient bank tend to follow an expansionist strategy, which may appear excessively risky. Hughes et al. (1994) suggest that, under the assumption of risk aversion, managers are willing to give up part of their compensations in favour of risk reduction. Miller and Noulas (1997) notice that an increase in credit risk leads to an improvement in profit margin, leading subsequently to an enhancement of efficiency (Johnes et al., 2013). Among the studies that corroborate a positive relationship between efficiency and risk we mention those of Altunbas et al. (2007), Yener et al. (2007), Yong and Christos (2013) and Saeed and Izzeldin (2014). However, Kwan and Eisenbeis (1997) point to a positive relationship between inefficiency and risk taking. In addition, Barajas et al. (1999) assume that banks have to incur additional expenses so as to manage properly any increase in credit risk. The negative relationship between efficiency and risk is also supported by Berger and De Young (1997), Deelchand and Padgett (2009).

The relationship between efficiency and capital was considered in the analysis of the relationship between capital, risk and efficiency. Hughes and Moon (1995) highlighted the importance of introducing an efficiency independent variable in empirical models dealing with the relationship between risk and capital. Examining a sample of European banks between 1992 and 2000, Altunbas et al. (2007) found that the most efficient banks tend to take more risks, while the least efficient banks appear to hold higher levels of capital with lower levels of credit risk. The same result is obtained by Yener et al. (2007) on a sample of commercial banks, savings banks and cooperative banks in Europe. Examining a sample of 263 Japanese cooperative banks over the 2003 to 2006 period, Deelchand and Padgett (2009) modelled the relationship between risk, capital and cost efficiency. The results of this modelling show that inefficient banks operate with more capital while maintaining a high level of risk. Yong and Christos (2013) assessed the relationship between risk, capital and efficiency on a sample of 101 Chinese commercial banks between 2003 and 2009. The authors found that banks with higher liquidity levels present lower pure and technical efficiencies and higher capitalization. However, examining a sample of US banks, Kwan and Eisenbeis (1997) found a positive relationship between efficiency and capitalization, which implies that the best-managed banks have a higher capacity of capital accumulation.

Size is among the other variables used to study efficiency determinants. In this regard, several empirical evidences proved the existence of a positive relationship between efficiency and size in the banking industry (Bhattacharryya et al., 1997), Miller and Noulas (1996), Jackson and Fethi (2000), Chen et al. (2005), Abdul Majid et al. (2005), Drake et al. (2003) and Yong and Christos (2013). However, Deelchand and Padgett (2009) show that large banks hold less capital, take more risks and are less efficient. Jensen (1986) argues that at a certain level the positive relationship between size and efficiency can be reversed when managers' power and their rewards largely relate to company growth and size.

The relationship between efficiency and market competitiveness has also aroused the interest of several authors. Berger and Mester (2003) found that competition conditions are likely to affect banking performance and efficiency. A negative relationship between concentration of an industry and efficiency is supported by Berger and Mester (1997) with the "quite life" theory (Note 4). The theory assumes the absence of incentives for efficiency when competition is low (high market concentration). Mean while, a positive relationship agrees with the "Information generating hypothesis" that supposes that a greater market power makes it easier to access information and thus contributes to improving banking efficiency. This finding is confirmed by Maudos and De Guevara (2007), Casu and Girardone (2009) and Koetter et al. (2011).

2.2 The Hypotheses

The literature review allowed us to formulate the four hypotheses presented in Table 1. These hypotheses represent the relationship between cost and revenue efficiency and risk, capital, size, and market structure.

Table 1. Hypotheses

	Relationship	Expected sign	Studies
H1	Risk and efficiency	+	Gorton and Rosen (1995), Hughes et al. (1994), Miller and Noulas (1997), Altunbas et al. (2007), Yener et al. (2007), Yong and Christos (2013), Johnes et al. (2013), Saeed and Izzeldin (2014).
H2	Capital and efficiency	-	Altunbas et al. (2007), Yener et al. (2007), Deelchand and Padgett (2009) Yong and Christos (2013).
H3	Size and efficiency	+	Bhattacharryya et al, (1997), Miller and Noulas (1996), Jackson and Fethi (2000), Chen et al. (2005), Abdul Majid et al. (2005), Drake et al. (2003), Yong and Christos (2013).
H4	Market competitiveness and efficiency	+	Berger and Hannan (1998), Delis and Tsionas (2009), Berger and Mester (2003) and Coccorese and Pellecchia (2010).

2. Methodology

Before describing the methodology, it should be made clear that the calculation of cost efficiency scores is done through the meta-frontier cost function proposed by Battese et al. (2004) (Note 5). The estimation of this function requires solving the following optimization program:

$$\text{Min } L^* \equiv \sum_{t=1}^{T}\sum_{i=1}^{N}\left[lnf\left(X_{it},\ \hat{\varphi}_{(r)}\right) - lnf(X_{it},\ \varphi^*)\right],\ \text{s/c } lnf(X_{it},\ \varphi^*) \le lnf\left(X_{it},\ \hat{\varphi}_{(r)}\right) \quad (1)$$

Where, $f\left(X_{it},\ \hat{\varphi}_{(r)}\right)$ is the stochastic frontier cost function associated with each banking group *r*; *r = 1*: Islamic banks group, *r = 2*: conventional banks group; X_{it} is the vector of inputs and outputs (three inputs and two outputs are considered); *i*: *1,..., N* (N is the total number of banks in the sample); *t*: 2006,..., 2012; $\hat{\varphi}_{(r)}$ is the vector of the estimated parameters of group *r*; $f(X_{it},\ \varphi^*)$ is the meta-frontier cost function that is defined as a global function having a mathematical form that includes all the deterministic elements of the stochastic cost functions developed individually; φ^* is the vector of parameters to be estimated.

Regarding revenue efficiency scores, they are also calculated following the resolution of the following optimization program:

$$\text{Min } L^* \equiv \sum_{t=1}^{T}\sum_{i=1}^{N}\left|lnf(X_{it},\ \varphi^*) - lnf\left(X_{it},\ \hat{\varphi}_{(r)}\right)\right|,\ \text{s/c } lnf\left(X_{it},\ \hat{\varphi}_{(r)}\right) \le lnf(X_{it},\ \varphi^*) \quad (2)$$

Where, $f\left(X_{it},\ \hat{\varphi}_{(r)}\right)$ is the stochastic frontier revenue function related to group r and $f(X_{it},\ \varphi^*)$ is the meta-frontier revenue function.

The evolution of the annual average of cost and revenue efficiency scores of IBs and CBs, obtained after the resolution of the two functions (1) and (2) (Note 6), are shown respectively in the two figures (1) and (2). Figure (3) presents the big similarity between the evolution trend of interest revenues and profits divided by total assets and that of the annual average of revenue efficiency scores.

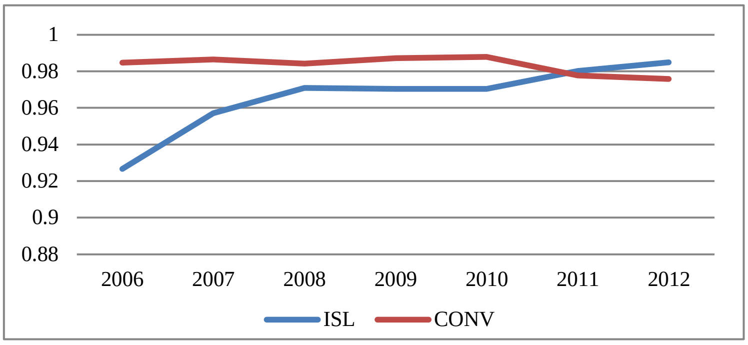

Figure 1. Annual average of cost efficiency scores measured by the MF

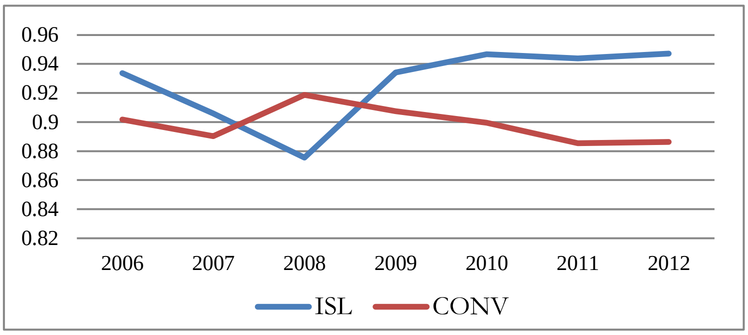

Figure 2. Annual average of revenue efficiency scores measured by the MF

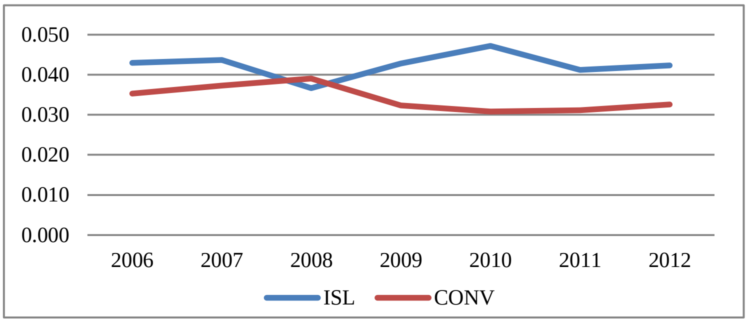

Figure 3. Interest or profit income/TA

Step 1: Calculating concentration ratios (C3 and C5), the Hirchmann Herfindahl index (HHI) and the Lerner index.

The issue of competition is of paramount importance in the banking sector because of its influence on financial stability (Demsetz et al., 1996), Hellmann et al. (2000), Allen and Gale (2004) and Jimenez et al. (2007) and on banking performance and efficiency (Berger & Mester, 2003).

To calculate competitiveness of the Malaysian market, we will proceed in three stages. The first consists in computing concentration indices C3 (total market shares of the three main banks) and C5 (total market shares of the five main banks) using total loans, total assets and total deposits. These two ratios are calculated taking into account the existence of two banking groups that are representative respectively of IBs and CBs. The second stage consists in calculating the HHI that is obtained by summing the squared market shares of banks belonging to the IBs group (ISL), CBs group (CONV) or to a third group representative of all banks (ALL). In the third stage we calculate the Lerner index by the difference between price and marginal cost. This latter index indicates to what extent a company can increase its marginal price beyond its marginal cost (Berger et al., 2009). Its calculation requires the estimation of the parameters of the following translog cost function:

$$LnCT_{it} = \beta_0 + \sum_{h=1}^{3} \alpha_h Ln(P_{hit}) + \sum_{k=1}^{2} \beta_k Ln(Y_{kit}) + \frac{1}{2}\sum_{h=1}^{3}\sum_{j=1}^{3} \alpha_{hj} Ln(P_{hit}) Ln(P_{jit}) +$$

$$\frac{1}{2}\sum_{j=1}^{2}\sum_{k=1}^{2} \beta_{jk} Ln(Y_{jit}) Ln(Y_{kit}) + \sum_{j=1}^{3}\sum_{k=1}^{2} \delta_{jk} Ln(P_{jit}) Ln(Y_{kit}) + \varepsilon_{it} \quad (3)$$

Where, CT_{it} is the total cost that includes finance charges and the amounts allocated to depositors in addition to personnel expenses, provision, amortization and other charges; P_{hit} denotes the three used inputs: physical capital (K), financial capital (F) and labour (W); Y_{kit}denotesthe two considered outputs: total loans and total securities portfolio. This model is similar to the above mentioned meta-frontier cost function. For this reason, we will retain the parameters obtained following the resolution of model (1) to calculate marginal cost with the following formula:

$$MC_{it} = \left[\sum_{k=1}^{2} \beta_k + \sum_{j=1}^{3}\sum_{k=1}^{2} \delta_{jk} Ln(P_{jit}) + \sum_{j=1}^{2}\sum_{k=1}^{2} \beta_{jk} Ln(Y_{jit})\right] \frac{CT_{it}}{Y_{1it}+Y_{2it}} \quad (4)$$

Where, $MC_{it}$is the cost of the last unit produced or marginal cost.

After calculating marginal cost, the Lerner index is determined as follows:

$$Lerner_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \quad (5)$$

Where, $P_{it}$is the average price of banking products (Y_{1it}, Y_{2it}).It is thus equal to the ratio of total revenues (TR_{it}: Interest revenues (Note 7) as well as those originating from other operating activities) to total assets bearing those revenues (Y_{1it}+ Y_{2it}) of bank *i* at time *t*, hence:

$$P_{it} = \frac{TR_{it}}{Y_{1it} + Y_{2it}} \quad (6)$$

2nd step: The study of the determinants of cost and revenue efficiency

Bearing in mind the four hypotheses to be tested, three sets of variables will be considered: bank-specific variables representing management quality, macroeconomic variables reflecting the influence of the economic environment and industry-specific variables. The selection of these variables will be carried out taking into account the multicollinearity problem that can cause unnecessarily large standard deviations, erroneous *t*-statistics (low or high) and parameters estimates of illogical signs. We will examine this issue in three stages. The first measures pair-wise correlation between the different variables. It is customary to consider that a correlation coefficient greater than 50% indicates the presence of a multicollinearity problem. The second stage consists in calculating VIFs (Variance Inflation Factors) after regression of each independent variable on the others. The VIF statistic for each variable is (1/ (1-R^2)). There is a multicollinearity problem when the value of this statistic is greater than 10 and / or when the average of the VIFs is greater than 2 (Chatterjee et al., 2000). If these two conditions are met, all considered independent variables can be preserved. Calculating the indicators defined by Belsley et al. (1980), namely condition indexes and variance decomposition, will be the subject of the last stage.

3rd step: Presentation of the model to be estimated

After selecting the different independent variables, measuring efficiency determinants consists in estimating the following model:

$$CE_{it}(RE_{it}) = \alpha + \beta X_{n,t} + \gamma M_t + u_n + \varepsilon_{n,t} \quad (7)$$

Where, *n = 1, ..., N* represents the banks; *t: 1, ..., T* represents time; $CE_{it}(RE_{it})$: a dependent variable that represents in the first step cost efficiency and in the second revenue efficiency;α represents the non-random fixed effect to be estimated; u_n~ IID(0,σ_u^2) is the random effect specific to each bank (*i*) and is constant over time; $\varepsilon_{n,t}$~ IID(0,σ_ε^2) represents the model's error or the unidentified random variations; $X_{n,t}$ is the vector of bank- and industry-specific variables; and $M_t$is the vector of macroeconomic variables.

The choice of the method to be followed to estimate this model requires the study of heteroskedasticity and autocorrelation problems. Various tests will then be performed. The test of Bera et al. (2001) and that of Wooldridge (2002) to study errors autocorrelation, and the test of Breusch and Pagan (1979) and the likelihood ratio to study the heteroskedasticity problem. Some previous studies have applied the random effects model taking into account errors heteroskedasticity problem (Hoff, 2007), McDonald (2009) and Johnes et al. (2013), whereas others used a Tobit regression model (Casu & Molyneux, 2003) and Sufian (2009).

3. Data

Our sample consists of 37 Malaysian commercial banks, 17 of which are IBs and 20 are CBs. The audited annual financial statements, which are available on the website of each of the banks in our sample, are the main sources of our data. In addition, data on the Malaysian financial system and macroeconomic indicators are extracted from the annual reports published by the BNM. The period of our study extends from 2006 to 2012. The total number of observations is 233: 103 observations for IBs and 130 for CBs. Table (A1) in the appendix summarizes the names of the banks, their nature (Islamic or conventional), affiliation (domestic or foreign), their creation date and the number of observations on each of them. It should be noted that all observations that might give biased results, because of their abnormal variability, were eliminated.

4. Presentation and Analysis of Results

Step1: Results of concentration indices (C3 and C5), the HH index and the Lerner index

The results in Table 2 indicate that a small number of banks are dominant in both IBs and CBs groups. Indeed, the C5 ratio calculated by total loans exceeded 70% in CBs and 60% in IBs. In addition, the calculation of both C3 and C5 ratios by total loans, total assets and total deposits reveals that the CBs group is more concentrated than IBs, except during the year 2006. This result is confirmed by the trend of the HHI of Islamic and conventional banks over the period 2006-2012 (Table 3).

Table 2. Calculation of C3 and C5 concentration ratios

Year	Loans C3		Loans C5		Assets C3		Assets C5		Deposits C3		Deposits C5	
	ISL	CONV	ISL	CONV	ISL	CONV	ISL	CONV	ISL	CONV	ISL	CONV
2006	0,6235	0,5696	0,8806	0,7218	0,6017	0,5547	0,7942	0,6841	0,6251	0,5520	0,8178	0,6907
2007	0,5024	0,5790	0,7119	0,7180	0,4783	0,5542	0,6751	0,6951	0,4938	0,5422	0,6809	0,6929
2008	0,4422	0,5652	0,5887	0,7138	0,3952	0,5392	0,5716	0,6957	0,4107	0,5437	0,5890	0,7061
2009	0,4870	0,5795	0,6638	0,7240	0,4521	0,5469	0,6394	0,6796	0,4661	0,5469	0,6536	0,7032
2010	0,4850	0,5744	0,6444	0,7174	0,4499	0,5403	0,6161	0,6916	0,4592	0,5403	0,6264	0,6936
2011	0,5181	0,5782	0,6731	0,7251	0,4595	0,5379	0,6414	0,6842	0,4686	0,5387	0,6521	0,7956
2012	0,5035	0,5687	0,6658	0,7054	0,4938	0,6444	0,5418	0,7091	0,5067	0,5397	0,6553	0,7125

Table 4 and Figure 4 summarize the evolution of the annual average of the Lerner index after being weighted by the market share associated with each bank belonging to the IBs group, CBs group or to all banks group. A higher average denotes a significant market power and subsequently poor competitiveness. Unlike the results of C3 and C5 and the HH index, the Lerner index’s averages indicate that over the period 2007-2012, IBs had a more significant market power than CBs. This result supports the findings of Berger et al. (2004) and Beck et al. (2006) who suggest that concentration ratios as well as the HHI are poor indicators of competitiveness degree. The Lerner index will be therefore used to evaluate efficiency determinants.

Table 3.HHI by total loans, total assets and total deposits

Year	Loans			Assets			Deposits		
	ISL	CONV	ALL	ISL	CONV	ALL	ISL	CONV	ALL
2006	0,188	0,1506	0,1104	0,1593	0,1367	0,0999	0,1702	0,1399	0,0996
2007	0,1284	0,1523	0,1078	0,1227	0,1386	0,0972	0,127	0,1326	0,0923
2008	0,1015	0,1453	0,0912	0,0870	0,1338	0,0833	0,0898	0,1371	0,0835
2009	0,1135	0,1474	0,0905	0,1017	0,1357	0,0845	0,105	0,1362	0,0834
2010	0,1113	0,1423	0,0847	0,0987	0,1322	0,0798	0,1011	0,1323	0,0782
2011	0,126	0,1448	0,0856	0,1099	0,1325	0,0785	0,1119	0,1322	0,0763
2012	0,1286	0,1453	0,0845	0,1198	0,1362	0,0799	0,1242	0,1345	0,0774

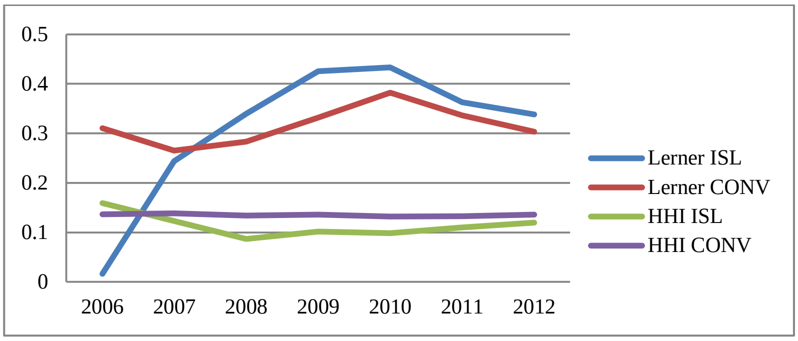

Figure 4. Annual average of the Lerner index and HHI over the period 2006-2012

Table 4. Annual average of the Lerner index over the period 2006-2012

	Islamic	Conventional	All
2006	0,01644408	0,31056506	0,11658335
2007	0,2440702	0,26525966	0,25699926
2008	0,33923568	0,28324371	0,28289016
2009	0,42525585	0,33183998	0,3370014
2010	0,43346136	0,38224193	0,37171997
2011	0,3628454	0,33603762	0,33390762
2012	0,33832483	0,3035825	0,30172982

2nd step: Results of the selection of the different independent variables

After diagnosing multicollinearity profiles and eliminated all the variables that can cause a multicollinearity problem, fifteen variables are used to study efficiency determinants (Note 8). Table 5 summarizes all these variables.

Table 5. Description of variables used to analyze the determinants of efficiency

Variables		Definition
Bank-specific variables		
Profitability		
Return on equity *ROE*	=	Pre-tax and zakat profit (loss) / Average shareholders' equity
Non-financing income margin *NFIM*	=	Non-finance income / Average total assets
Return on deposit *ROD*	=	Pre-tax and zakat profit (loss)/ Average total customer deposits
Gross NPF ratio *GNPF*	=	Total non performing financing/Average gross loans and advances
Liquidity		
Financing to deposits ratio *FTDR*	=	Net financing / Average total customer deposits
Cash to deposits *CTD*	=	Cash / Average total customer deposits
Capital		
Risk weighted capital ratio *RWCR*	=	Eligible capital/Total risk-weighted assets
Liabilities to shareholder capital *LTSC*	=	Average total liabilities / Shareholder capital
Efficiency		
Interest expenses to deposits *IETD*	=	Interest expenses/ Average total customer deposits
Interest income to expenses *IITE*	=	(Interest income−interest expenses) / Average loans and advances
Others		
Size *Assets*	=	Total assets
Islamic	=	A binary variable to reflect whether or not the bank is classified as Islamic
Industry specific variables		
Lerner index	=	Annual Lerner index
Macroeconomics variables		
GDP growth *GGDP*	=	Annual GDP growth rate
National house price index *NHPI*	=	Annual NHPI growth rate (in real terms)

The descriptive statistics of these variables, shown in Table 6, are calculated after setting three time intervals: before, during and after the subprime mortgage crisis. The average of the intermediation ratio FTDR indicate that total credits to total deposits of IBs followed an upward trend during and after the subprime crisis. CBs almost kept the same percentage during the same period. This result reflects the Malaysian system's resistance to the last financial crisis.This finding is confirmed by the downward trend of the averages of the GNPF ratio over the entire period 2006-2012. Furthermore, analysis of the average of RWCR shows that starting from the second period CBs decided to increase their risk weighted capital. The decision of IBs is different given that the average of this ratio decreased from 19,4% to 16,2% between the second and the third period (see also Figures 5a and 5b). The evolution trend of this ratio provides us then with the possibility to evaluate the effects of change in regulatory capital on efficiency. The difference between CBs and IBs is also reflected through the profitability indicators. Indeed, when the average of the ROE ratio of CBs recorded a decrease between the second and third period, that of IBs increased from 9,6% to 14,2%.

3rd Step: Analysing the determinants of cost and revenue efficiency

The study of efficiency determinants begins with running specification tests whose results are shown in Table 7. The Lagrange multiplier test developed by Baltagi and Li (1990) for unbalanced panel data, originally devised by Breush and Pagan (1980) for balanced panel data, attests for the validity of the random effects model as p-value of each dependent variable is below 5% (rejection of hypothesis H(0)). However, Bera and Yoon (1993) show that in the presence of first-order autocorrelation, the Lagrange multiplier test developed by Baltagi and Li (1990) tends to reject the null hypothesis of the absence of random effects even if it is correct. For this reason, a modified Lagrange multiplier test was developed by Bera et al. (2001) for balanced and unbalanced panel data.

Table 6. Descriptive statistics of the independent variables

	Conventional						Islamic						All	
	2006/07		2008/09		2010/12		2006/07		2008/09		2010/12		2006/12	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
ROE	0,160	0,135	0,181	0,100	0,146	0,102	-0,184	1,303	0,096	0,098	0,142	0,132	0,156	0,401
NFIM	0,012	0,005	0,012	0,011	0,011	0,006	0,007	0,008	0,003	0,003	0,004	0,002	0,008	0,006
ROD	0,037	0,042	0,032	0,038	0,021	0,035	-0,100	0,454	0,010	0,013	0,011	0,029	0,226	0,139
GNPF	0,051	0,023	0,030	0,024	0,022	0,022	0,063	0,066	0,036	0,041	0,024	0,041	0,034	0,036
FTDR	0,882	0,755	0,824	0,560	0,819	0,676	0,668	0,374	0,836	0,339	0,889	0,240	0,833	0,543
CTD	0,724	0,915	0,505	0,645	0,888	1,619	0,660	0,560	0,462	0,297	0,346	0,262	0,556	0,982
RWCR	0,239	0,260	0,171	0,065	0,293	0,445	0,344	0,577	0,194	0,161	0,162	0,066	0,196	0,313
LTSC	75,125	98,81	80,433	108,1	84,885	126,1	15,125	9,457	48,878	65,46	76,499	133,6	69,851	108,98
IETD	0,063	0,058	0,041	0,027	0,032	0,018	0,033	0,017	0,028	0,013	0,032	0,008	0,143	0,030
IITE	0,093	0,190	0,059	0,061	0,129	0,357	0,088	0,143	0,046	0,019	0,046	0,015	0,081	0,205
Assets	44507	55076	50066	60711	56915	76141	7361	4858	11232	8704	18601	18212	35560	54564
GGDP	0,059	0,003	0,017	0,032	0,059	0,008	0,060	0,003	0,018	0,032	0,060	0,008	0,047	0,027
NHPI	0,007	0,024	0,001	0,008	0,072	0,018	0,010	0,025	0,000	0,008	0,071	0,021	0,035	0,039

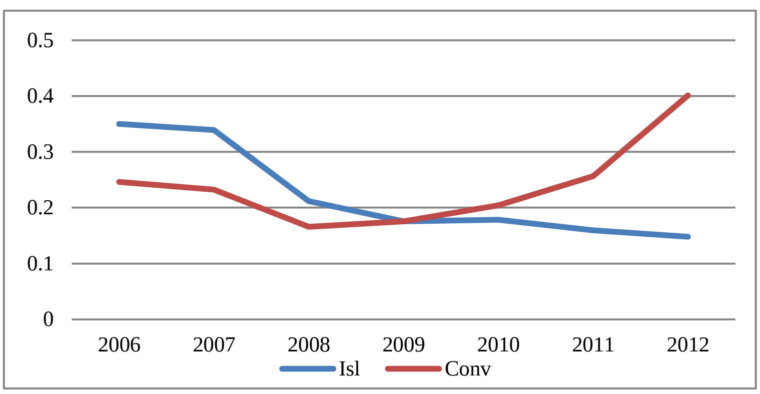

Figure 5a. The evolution of the average RWCR

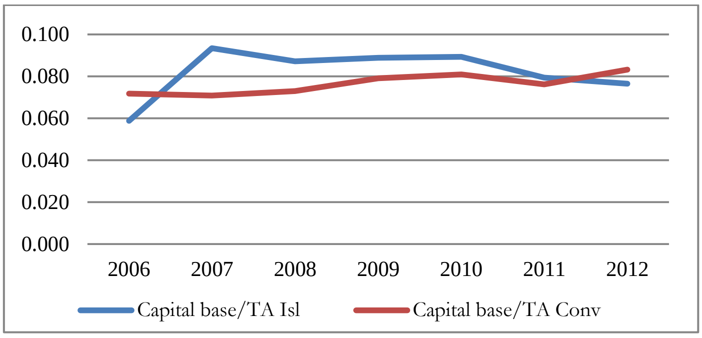

Figure 5b. The evolution of capital base

The results, reported in Table 6, show that the test of random effects (LM (Var (u) = 0)) and the joint test of Baltagi and Li (1991) for serial correlation and random effects reject the null hypothesis which indicates the absence of random effects. However, the results of the modified version of the Lagrange multiplier test (ALM (Var (u) = 0)) developed by Bera et al. (2001) fail to reject the null hypothesis and prove that rejecting the null hypothesis of the joint test is mainly the result of the presence of a serial correlation problem. This finding is confirmed by Wooldridge (2002) whose null hypothesis, which was rejected, assumes the absence of first-order autocorrelation. As for the heteroskedasticity problem, the results of the Breusch and Pagan (1979) test and the Likelihhod Ratio test, whose null hypothesis is in favour of an errors homoskedasticity, show that H0 hypothesis is widely rejected, which proves the presence of a heteroskedasticity problem. Among the solutions proposed to solve these two problems (first-order autocorrelation and heteroskedasticity), we opted for the FGLS method developed by Parks (1967). Table (8) provides the estimation results of the two efficiency models through this method.

Table 7. Model specification tests

	CE			RE		
1-Lagrange multiplier test: CE (RE) [id,t] = Xb + u[id] + e[id,t]/ Test: Var (u) = 0						
chibar2(01)	= 3,64			= 26,50		
Prob> chibar2	= 0,0282			= 0,0205		
2-Random effects and order-one serial correlation test						
CE (RE) [id,t] = Xb + u[id] + v[id,t]/ v[id,t] = lambda v[id,(t-1)] + e[id,t]						
Random Effects, Two Sided:						
LM (Var(u)=0)	= 3,64	Pr>chi2(1) =	0,0563	=26,50	Pr>chi2(1) =	0,0410
ALM (Var(u)=0)	= 0,77	Pr>chi2(1) =	0,3799	= 0,02	Pr>chi2(1) =	0,8880
Random Effects, One Sided:						
LM (Var(u)=0)	=1,91	Pr>N(0,1) =	0,0282	= 5,15	Pr>N(0,1) =	0,0000
ALM (Var(u)=0)	=-0,88	Pr>N(0,1) =	0,8100	= -0,14	Pr>N(0,1) =	0,5560
Serial Correlation:						
LM (lambda=0)	=22,72	Pr>chi2(1) =	0,0000	= 90,40	Pr>chi2(1) =	0,0000
ALM (lambda=0)	=19,84	Pr>chi2(1) =	0,0000	=63,91	Pr>chi2(1) =	0,0000
Joint Test:						
LM (Var(u)=0,lambda=0)	=23,49	Pr>chi2(2) =	0,0000	= 90,42	Pr>chi2(2) =	0,0000
3- Wooldridge test for autocorrelation in panel data, H0: No first order autocorrelation						
F (1, 35)	= 7,758			= 49,124		
Prob> F	= 0,0086			= 0,0387		
4-Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, Ho: Constant variance						
chi2(1)	= 17,33			= 4.27		
Prob> chi2	= 0,0286			= 0,0387		
5- Likelihood-ratio test, H0: Error term is homoscedastic						
LR chi2(37)	= 369,04			= 299,55		
Prob> chi2	= 0,0000			= 0,0000		

The results show a negative and a statistically significant relationship at the 1% level between the “Islamic” variable and cost efficiency, which confirms the hypothesis indicating that Islamic banking activity is known by higher personnel and administrative costs than that of CBs. Estimating the second model, we come to reject this hypothesis given that the relationship between revenue efficiency and the "Islamic" variable becomes positive and statistically significant at the 1% level, which is partially explained by the high profit and income originating from operations carried out by IBs compared to the interest-based revenues of CBs (see Figure 3).

Table 8. Estimation of the two efficiency models by the FGLS method

	CE			*RE*		
	Coef.	Std. Err.	P>|z|	Coef.	Std. Err.	P>|z|
ROE	-0,0030627	0,0012885	0,017	0,0108006	0,0057536	0,060
NFIM	-1,233642	0,0989838	0,000	3,42482	0,4387366	0,000
ROD	0,2220435	0,0058081	0,000	-0,0423965	0,0273205	0,121
IETD	-0,0342347	0,0304419	0,261	-0,2693107	0,141069	0,056
IITE	-0,0006908	0,0036773	0,851	0,0184327	0,0204068	0,366
GNPF	0,0204916	0,0204916	0,000	0,0441019	0,0565382	0,435
FTD	-0,0025709	0,0018861	0,173	0,0062755	0,0073635	0,394
CTD	0,0016454	0,000871	0,059	-0,0088897	0,0033111	0,007
RWCR	-0,0251374	0,0019555	0,000	- 0,0426305	0,006314	0,000
LTSC	6,14e-06	6,14e-06	0,002	0,0000203	0,000019	0,285
Islamic	-0,018867	0,0022155	0,000	0,0566205	0,0068511	0,000
ASSETS	7,91e-08	1,93e-08	0,000	1,75e-07	4,24e-08	0,000
Lerner	-0,0002178	0,0001402	0,120	0,000753	0,0001663	0,000
GGDP	-0,0058414	0,0094104	0,535	0,0249665	0,0459758	0,587
NHPI	0,0251452	0,0114218	0,028	-0,0536915	0,0448147	0,231
Cons	0,9946601	0,0026838	0,000	0,8695501	0,0111616	0,000
No. of observations			233			233
No. of banks			37			37
Wald $\boldsymbol{X}^2_{15}$			4984.58			559.27
Prob> $\boldsymbol{X}^2_{15}$			0,0000			0,0000

The GNPF variable (credit risk) presents a positive and a statistically significant coefficient at the 1% level in the first model which is consistent with the findings of Miller and Noulas (1997), Gorton and Rosen (1995), Altunbas et al. (2007), Yener et al. (2007), Yong and Christos (2013) and Saeed and Izzeldin (2014). Both CTD and FTDR variables reveal that an increase in liquidity improves cost efficiency (Note 9) and deteriorates revenue efficiency. The positive effect of the intermediation activity (as indicated by FTDR ratio) on revenue efficiency is also confirmed by the positive sign of the IITE ratio. These results partially support hypothesis (H1) which supposes a positive relationship between efficiency and risk.

The negative and statistically significant coefficient of RWCR implies that an increase in capital decreases efficiency, confirming hypothesis (H2). The nature of this relationship can be explained by the proposals of Jensen (1986), who highlighted the problem of "free cash flow" arising from the way available flows are allocated after funding all profitable projects. The negative relationship between efficiency and capital is also validated by Deelchand and Padgett (2009) and Altunbas et al. (2007) who prove that inefficient banks seem to operate with more capital. In this regard Jensen proposes the recourse to debt as a tool to control manager's behaviour. This proposal explains the positive sign of the LTSC ratio (total liabilities divided by total equity). Indeed, with the issuance of new debts to finance new projects, Jensen explains that managers are at risk of losing their jobs in case the company does not comply with its' commitments to its creditors. It should be noted that the LTSC coefficient is statistically significant at the 1% level.

A negative and a statistically significant relationship was observed between the two profitability ratios, ROE and NFIM, and cost efficiency. The negative relationship between financial return ROE and cost efficiency is consistent with the results of Kablan and Yousfi (2011) on a sample of IBs and CBs. However, Table (8) shows a positive relationship between these two ratios and revenue efficiency scores. Such contradictory effects of profitability reflect the burden of personnel expenses and other overheads and expenditures incurred by the most profitable banks in order to achieve better revenues. It should be mentioned that throughout the period of our study, Malaysian banks have incurred huge personnel and administrative costs to improve their capacity of risk and cost management. In addition, the effect of operating expenses on cost efficiency can be observed through the positive sign of the ROD ratio. Indeed, a strong negative correlation (-0.9428) is detected between this ratio and the COTAA ratio (Cost over total average assets). An increase in the ROD ratio then comes in parallel along a decrease in the COTAA ratio and afterwards results in improvement in cost efficiency.

Regarding the size variable, its impact on cost and revenue efficiency is positive and statistically significant at the 1% level, which corroborates hypothesis (H3). However, Jensen (1986) states that starting from a certain level, this relationship can be reversed as soon as the power of managers and their compensation largely depend on company growth and size. This latter finding has prompted us to examine change in cost and revenue efficiency across different sizes. To this end, three sizes were identified: small banks (between 1 million RM and 20 millions RM), medium-sized banks (between 20 million RM and 50 million RM) and large banks (more than 50 million RM).

Table 9. Cost and revenue efficiency according to each size

	CE			*RE*		
Size	Mean	SD	*p-value*	Mean	SD	*p-value*
Small	0,9713102	0,0044613		0,8999639	0,0065259	
Medium	0,9841449	0,0019537	0,0568	0,9344156	0,0063957	0,0027
Large	0,9887748	0,0016257	0,0366	0,9143073	0,0061245	0,0153

Estimating cost and revenue efficiency across these different sizes shows mixed results (Table 9). Indeed, whereas cost efficiency shows a statistically significant increase as we progress from small banks to large banks, the difference between revenue efficiency of large banks and that of small ones remain negative and statistically significant at the 5% level. These results support the findings of Jensen (1986) and confirm that some Malaysian banks have reached their optimal size.

Table 10. Cost and revenue Efficiency according to size and banking category

	CE			*RE*		
Size	Mean ISL	Mean CONV	*p-value*	Mean ISL	Mean CONV	*p-value*
Small	0,9624455	0,9838545	0,0087	0,9176829	0,8748899	0,0005
Medium	0,9841621	0,9841294	0,5033	0,9514582	0,9189961	0,0047
Large	0,9859016	0,9890314	0,3008	0,9608556	0,9101512	0,0109

Table 10 shows that a decrease in revenue efficiency for large banks is explained by a low average of efficiency scores obtained by CBs. In terms of cost efficiency, small size IBs seem to be less efficient than CBs. The difference between the two averages is statistically significant at the 1% level. This difference becomes insignificant for medium and large banks. This result reaffirms the positive effect of size on efficiency and points to one of the most important factors behind the weakness of the cost efficiency of IBs between 2006 and 2010. As for revenue efficiency, all obtained averages support the superiority of IBs over CBs.

Regarding the three exogenous variables, only the NHPI variable is statistically significant in the first model. This result reflects the importance of the measures undertaken by the Malaysian banks to protect themselves against risks arising from an excessive price increase in the real estate market. In the second model, the Lerner variable coefficient is positive and statistically significant which reflects a negative relationship between competitiveness and revenue efficiency, hence the rejection of hypothesis (4). The insignificant effect of economic development (GGDP) is also supported by Saeed and Izzeldin (2014) (Note 10).

5. Conclusion

The main aim of this paper is to study the determinants of cost and revenue efficiency in the Malaysian banking sector known by a coexistence of IBs and CBs. The calculation of competitiveness degree for this sector was the subject of the first step. Three types of indexes are calculated: the two concentration indexes C3 and C5, the HH index and the Lerner index. The results obtained from the C3 and C5 concentration indexes and the HH index indicate that the CBs group is generally more concentrated than IBs. The Lerner index present different results because it indicates that in the period 2007-2012 CBs have a greater competitiveness degree than IBs. These different results support the findings of Berger et al. (2004) and Beck et al. (2006) who found that concentration ratios and the HH index are poor indicators of competitiveness degree. In addition to the Lerner index (industry-specific variable), the second step allowed for the identification of two sets of variables: bank-specific variables (profitability, liquidity, capital, efficiency and size), and macroeconomic variables (GDP growth and National house price index). The last step involves the use of the FGLS method to estimate the coefficients of the efficiency models. This step provided supervision authorities and especially managers with useful information on ways to improve performance. The obtained results show that the *Islamic* variable presents a negative and a statistically significant relationship with cost efficiency and a positive one with revenue efficiency. This result can be explained by the fact that personnel expenses and administrative costs of IBs are more important than higher profit and commission income. The GNPF variable reveals a positive relationship between cost efficiency and credit risk while the two liquidity ratios (CTD and FTD) show that any increase in liquidity leads to an improvement in cost efficiency at the expense of revenue efficiency. These latter results partially support hypothesis H1 which supposes a positive relationship between efficiency and risk. As for hypothesis H2, it is confirmed since the results of the two efficiency models support the presence of a negative relationship between regulatory capital and efficiency. It should be noted that the regulatory capital of IBs, until the end of 2010, was higher than that of CBs. As for the size variable, the results are consistent with our expectations, since any increase in size leads to an increase in efficiency. The study of this relationship, while taking into account bank category, shows that the difference between Islamic and conventional banks in terms of cost efficiency becomes insignificant in both medium and large banks. Moreover, the results indicate that revenue efficiency of CBs decreased starting from a certain size level. This result confirms Jensen's proposal which supposes the existence of an optimal size. As for the influence of competitiveness, a positive and a statistically significant relationship was found between the Lerner variable and revenue efficiency, hence the rejection of hypothesis H4.

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Appendix

Table A1. Description of the selected sample

Banks	N°	Nature	D/F*	Creation date	Number of Observations
Bank Islam Malaysia	1	Isl	D	1983	7
Bank Muamalat Malaysia	2	Isl	D	1999	6
Affin Islamic Bank Berhad	3	Isl	D	2005	7
CIMB Islamic Bank	4	Isl	D	2005	7
EONCAP Islamic Bank **	5	Isl	D	2005	5
Hong Leong Islamic Bank**	6	Isl	D	2005	7
RHB Islamic Bank	7	Isl	D	2005	7

AmIslamic Bank	8	Isl	D	2006	6
My Bank Isamic	9	Isl	D	2007	5
Alliance Islamic Bank	10	Isl	D	2007	5
Public Islamic Bank	11	Isl	D	2008	5
Kuwait Finance House	12	Isl	F	2004	7
Al Rajhi Banking	13	Isl	F	2006	7
Asian Finance Bank	14	Isl	F	2006	7
OCBC Al Amin Bank Berhad	15	Isl	F	2008	5
Standard Chartered	16	Isl	F	2008	5
HSBC Amanah	17	Isl	F	2008	5
Hong Leong Bank	18	Conv	D	1934	7
Maybankberhad	19	Conv	D	1960	7
Public Bank Berhad	20	Conv	D	1960	7
Am Bank Berhad	21	Conv	D	1975	7
RHB Bank	22	Conv	D	1997	7
Affin Bank Berhad	23	Conv	D	2001	7
Alliance Bank Berhad	24	Conv	D	2001	7
Bongkok Bank Berhad	25	Conv	F	1959	7
JP Morgan Chase Berhad	26	Conv	F	1964	7
Deutsche Bank Berhad	27	Conv	F	1967	7
Standard Chartered Bank Malaysia	28	Conv	F	1984	7
United Overseas Bank Berhad	29	Conv	F	1993	7
Bank of TokoyoBerhad	30	Conv	F	1994	7
HSBC Bank	31	Conv	F	1994	7
OCBC Bank Berhad	32	Conv	F	1994	7
The Bank of Nova Scotia Berhad	33	Conv	F	1994	7
Bank of China Berhad	34	Conv	F	2001	6
The Royal Bank of Scotland Berhad	35	Conv	F	2007	7
Industrial and Commercial Bank of China	36	Conv	F	2010	3
BNP Paris Malaysia Berhad	37	Conv	F	2010	2
Total	37				233

Isl: Islamic; Conv: Conventional.

*Domestic or foreign bank;

** The bank Hong Leong Islamic Bank completed in November 2011 its merger with the EONCAP Islamic Bank.

Table A2. The correlation matrix

	ROE	NFIM	ROD	IETD	IITE	GNPF	FTD	CTD	RWCR	LTSC	Islamic	Assets	Lerner	GGDP	NHPI
ROE	1,000														
NFIM	0,092	1,000													
ROD	0,161	0,160	1,0000												
IETD	0,002	0,131	0,1923	1,0000											
IITE	-0,026	0,110	-0,119	0,083	1,000										
GNPF	-0,329	-0,041	-0,006	0,030	-0,056	1,000									
FTD	0,013	-0,191	0,150	0,529	-0,269	-0,027	1,000								
CTD	-0,055	0,089	0,044	0,423	0,313	-0,106	0,138	1,000							
RWCR	-0,058	-0,063	-0,383	0,000	0,173	-0,157	-0,112	0,474	1,000						
LTSC	0,158	0,254	0,056	-0,148	-0,052	-0,144	-0,028	-0,172	-0,172	1,000					
Islamic	-0,122	-0,523	-0,142	-0,192	-0,110	0,100	-0,009	-0,147	-0,056	-0,118	1,000				
Assets	0,120	0,137	0,046	-0,152	-0,121	-0,039	-0,007	-0,246	-0,171	0,163	-0,343	1,000			
Lerner	0,077	0,102	0,091	0,024	-0,022	0,029	0,089	-0,117	-0,301	0,121	-0,209	0,120	1,000		
GGDP	-0,010	0,062	-0,017	0,110	0,051	0,029	0,017	0,076	0,069	0,005	-0,037	0,016	0,003	1,000	
NHPI	0,087	-0,051	0,056	-0,138	0,047	-0,220	-0,012	0,045	0,058	0,095	-0,005	0,094	-0,032	0,320	1,000

Table A3. Centered and uncentered Variance Inflation Factors (VIFs)

Variables	Centered VIF	1/VIF	Variables	Uncentered VIF	1/VIF
IETD	2,12	0,471363	IETD	5,36	0,186492
CTD	1,99	0,503402	FTD	5,26	0,190280
RWCR	1,97	0,506703	GGDP	4,56	0,219178
FTD	1,88	0,531142	NFIM	3,19	0,313072
Islamic	1,80	0,555934	CTD	2,75	0,363197
NFIM	1,69	0,591772	RWCR	2,66	0,375282
ROD	1,40	0,716129	NHPI	2,30	0,434903
Assets	1,34	0,747018	Islamic	2,06	0,486044
IITE	1,33	0,754673	GNPF	2,04	0,489660
NHPI	1,28	0,778738	Assets	1,71	0,585760
GNPF	1,26	0,795792	LTSC	1,70	0,588492
LTSC	1,21	0,823794	IITE	1,46	0,686943
ROE	1,19	0,838158	ROD	1,40	0,714862
Lerner	1,19	0,839490	ROE	1,27	0,784732
GGDP	1,18	0,846060	Lerner	1,22	0,820814
Mean VIF	1,52		Mean VIF	2,60	

Table A4. Table of condition indexes and variance decomposition

	Indexes	*Variance decomposition*															
		Cons	ROE	NFIM	ROD	IETD	IITE	GNPF	FTD	CTD	RWCR	LTSC	Islamic	Assets	Lerner	GGD	NHPI
1	1,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2	2,03	0,00	0,05	0,00	0,08	0,00	0,02	0,00	0,00	0,02	0,03	0,03	0,01	0,03	0,08	0,00	0,00
3	2,42	0,00	0,09	0,00	0,02	0,00	0,11	0,06	0,00	0,05	0,01	0,00	0,05	0,00	0,01	0,00	0,00
4	2,54	0,00	0,08	0,00	0,23	0,02	0,00	0,03	0,00	0,03	0,01	0,06	0,00	0,04	0,01	0,00	0,01
5	2,64	0,00	0,14	0,00	0,10	0,00	0,08	0,03	0,00	0,00	0,00	0,00	0,02	0,01	0,32	0,00	0,01
6	3,03	0,00	0,17	0,02	0,05	0,00	0,00	0,00	0,01	0,00	0,00	0,01	0,08	0,14	0,32	0,00	0,00
7	3,11	0,00	0,00	0,00	0,06	0,01	0,36	0,00	0,01	0,02	0,05	0,06	0,05	0,05	0,02	0,00	0,02
8	3,41	0,00	0,00	0,02	0,01	0,01	0,03	0,00	0,00	0,00	0,00	0,41	0,00	0,13	0,02	0,01	0,20
9	3,42	0,00	0,30	0,00	0,02	0,00	0,08	0,11	0,00	0,02	0,01	0,13	0,00	0,04	0,04	0,00	0,19
10	4,15	0,00	0,06	0,05	0,04	0,06	0,10	0,24	0,07	0,00	0,10	0,02	0,01	0,12	0,03	0,01	0,02
11	4,47	0,00	0,00	0,06	0,17	0,05	0,00	0,01	0,00	0,10	0,11	0,06	0,12	0,23	0,07	0,04	0,10
12	5,08	0,01	0,09	0,21	0,05	0,00	0,00	0,42	0,01	0,09	0,04	0,14	0,13	0,00	0,04	0,02	0,13
13	5,65	0,00	0,01	0,11	0,18	0,01	0,11	0,00	0,05	0,55	0,42	0,02	0,10	0,04	0,00	0,01	0,01
14	6,27	0,00	0,00	0,11	0,00	0,00	0,01	0,01	0,05	0,04	0,03	0,03	0,01	0,01	0,00	0,83	0,21
15	8,04	0,01	0,00	0,02	0,00	0,84	0,04	0,00	0,54	0,06	0,06	0,04	0,07	0,06	0,02	0,03	0,07
16	13,15	0,98	0,01	0,38	0,01	0,00	0,06	0,08	0,25	0,01	0,14	0,00	0,37	0,09	0,00	0,04	0,01

Notes

Note 1. Financial stability and payment systems report 2012.

Note 2. Financial stability and payment systems report 2012.

Note 3. The market share of the five largest Malaysian banking groups has increased to reach 61,1% in 2007 compared to52,5% in 2001.

Note 4. The quiet life hypothesis, John Hicks.

Note 5. A more detailed analysis of the calculation of efficiency scores in the Malaysian context using the meta-frontier approach is presented in Ghroubi and Abaoub (2016).

Note 6. The resolution of the two optimisation programs (1) and (2) is carried out by the genetic algorithm method.

Note 7. The term "interest" is replaced by *profit* or by *commission income* in the case of Islamic banks.

Note 8. Tables 7 (A2), (A3) and (A4) of the appendix represent respectively the correlation matrix, the results of the centered and uncentered Variance Inflation Factors (VIFs) and the table of condition indexes and variance decomposition.

Note 9. A positive effect of liquidity on cost efficiency is also validated by several previous studies conducted in the context of IBs and European banks (Hasan and Dridi (2010)).

Note 10. To evaluate the effect of economic growth, Saeed and Izzeldin (2014) use GDP per capita.

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Adjusting Time for Uncertain Project Assessment

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Abstract

This paper presents a novel methodology to include the risk when determining the net present value of an investment. More specifically, the risk of cash flows is priced by the delay in the payment of debts not at the initially agreed maturities, but at later dates. To do this, first we recall the classical methods which introduce a certain risk correcting parameter before determining the net present value of the project. The key idea of this new model is to transfer the risk to the time embedded in the expression of the discount function by using a suitable deformation of this parameter. In this way, the risk is measured by the delay in the initially agreed maturity when obtaining the corresponding cash flow. On the other hand, the way to include the risk in a project is based on an adaptation of the Krugman's curve which describes the relationship between debt maturities and their respective expectations of being obtained. The empirical contribution is based on the use of real data of payment delays corresponding to Spanish companies in 2015. This procedure allows to fit the risk of an investment project from a more realistic perspective and so to determine more accurately its net present value.

Keywords: investment project, risk, net present value, deformation of time

1. Introduction

In this paper we present a novel methodology to introduce the risk when determining the net present value (*NPV*) of an investment project. In effect, it is well known that:

$$NPV = -I_0 + \sum_{t=1}^{n} CF_t (1+i)^{-t}, \tag{1}$$

where I_0 is the investment at time 0, CF_t is the expected cash flow corresponding to period t ($t = 1, 2, \ldots, n$), i is the interest rate, and n is the number of periods (De Pablo, 1991, 1998 and 2000). The risk inherent to the investment project can be embedded in Equation (1) by considering several methods to modify the parameters defining the *NPV* (Gil Peláez, 1992) so that the present value can be determined following a criterion of prudence (Jiménez, 2003). More specifically, two different approaches can be implemented, in this paper a brief review of existitng model is done in section 2 and 3:

1) If the cash flows are random variables, they can be substituted in Equation (1) by their respective mathematical expectations:

$$NPV = -I_0 + \sum_{t=1}^{n} E(\xi_t)(1+i)^{-t} \tag{2}$$

where ξ_t denotes the random cash flow associated to period t ($t = 1, 2, \ldots, n$), and then they can be multiplied by an adjusting factor based on the standard deviation of each random variable (see Section 2).

2) If the cash flows are not random variables, we can modify the interest rate and the time parameter. Inside this second alternative, there are several possibilities:

a. To introduce an adjusting factor for the cash flows as previously indicated in the approach 1 (see Section 2).
b. To introduce an adjusting parameter for the interest rate (see Section 3):
   i. By summing up a premium to the interest rate.
   ii. By introducing a factor affecting the interest rate.
c. To introduce an adjusting factor for the time (see Section 3).

A noteworthy advantage of the last two models is that they treat the risk by considering the project as a whole. Nevertheless, they exhibit the disadvantage of determining the concrete values of the risk parameters suitable for each project. Take into account that the choice of an adjusting factor or risk premium may entail a high degree of subjectivity by the analyst. In other words, an inaccurate choice of parameters may imply that the emerging results do not represent the expected value properly (Gil & Gil, 1987) and so it should be necessary to proceed carefully.

This paper aims to quantify the Net Present Value corresponding to a risky or uncertain investment where the risk is represented by the possible deviation of the expected values of the cash flows involved in the project. To do this, we can use 'direct' methodologies such as introducing an adjusting factor to cash flows, or 'indirect' procedures such as introducing a risk premium, introducing a divisor to the discount rate or introducing a multiple to cash flow maturities. With respect to the procedures involving the interest rate, it is necessary to take into account the "return/risk binomium". In effect, if the profitability required to a certain investment is given, a risky investment (due to uncertain cash flows) will require an upper return. This is the reason whereby a risk premium is summed up to the profitability or the interest rate is affected by a divisor: the resulting NPV is thus more conservative.

Traditional models do not properly price the risk associated to the cash flows. Indeed, this justifies the implementation of a new, more objective model to quantify the risk inherent to a project. In this paper we aim to include the risk in the project assessment by deforming the time which represents the maturity of each cash flow. In this way, our paper generalizes the last methodology used to include the risk (introduction of an adjusting factor for the time) because it can be considered as a linear deformation of time. For this purpose, we also start from the formula of the *NPV* (Fernández, 1992) where the future cash flows are discounted by using a given rate of interest (constant or variable), and then their aggregate value is compared with the investment at instant 0 (Brealey & Myers, 2002; and Brealey et al., 2014). The calculation of the net present value uses a simple and intuitive formulation which takes into account the value of money over time when discounting future cash flows (Loring, 2007).

To avoid the problem of the subjectivity underlying to the risk parameter used to value, in this paper we are going to consider the risk as a function of the perception (Loewenstein et al., 2003) that creditors have about possible delays in the receipt of payments by debtors. As a result, the project risk is transferred to the parameter time of the discount function used for the assessment. So the use of this model provides a risk-adjusted value of the time parameter that allows discounting future cash flows from a more realistic perspective than the traditional ones. To do this, we will base our approach on real data of delays in payments.

The organization of this paper is as follows. In Section 2, the model to introduce the risk in the expression of the *NPV* is presented by adjusting the cash flows by a suitable coefficient. Section 3 considers the risk based upon the adjustment of the discount rate and time, showing the relationship between the parameters used in each method. Section 4 presents our novel methodology which is the main contribution of this paper. Finally, Section 5 summarizes and concludes.

2. Using an Adjusting Factor to Cash Flows

This procedure consists in multiplying each cash flow, CF_t, by an adjusting factor, α_t ($t = 1, 2, \ldots, n$). This coefficient must be between 0 and 1, and the higher is the risk the smaller the coefficient (Cruz and Valls, 2008). The modified net present value when including these coefficients, denoted by NPV^*, is:

$$NPV^* = -I_0 + \sum_{t=1}^{n} \alpha_t CF_t (1+i)^{-t}. \tag{3}$$

In the particular case in which the coefficients are constant, $\alpha_t = \alpha$, for every *t*, the modified net present value, denoted by NPV^{**}, would remain as follows:

$$NPV^{**} = I_0 + \alpha \sum_{t=1}^{n} CF_t (1+i)^{-t}. \tag{4}$$

Indeed the difficulty of this methodology consists in specifying the values of α_t or the value of the unique coefficient α. Nevertheless, if the cash flows involved in the project are random, the coefficients α_t can be approximated according to the standard deviation, $\sigma(\xi_t)$, and the mean, $E(\xi_t)$, of each cash flow ξ_t, since the risk can be defined as the relative deviation of this random amount with respect to its expected value. In this way, a possible procedure solution could be a suitable multiple of the coefficient of variation defined by $CV_t := \sigma(\xi_t)/E(\xi_t)$. Thus,

$$\alpha_t = 1 - \lambda CV_t \tag{5}$$

where λ is a subjective constant parameter whose value is determined by the condition that the adjusting factor must vary between 0 and 1, that is, $0 < \alpha_t < 1$, for every *t*. Below, we can see the concrete expression of the modified net present value by using the adjusting factors defined in (5):

$$NPV^{*} = -I_0 + \sum_{t=1}^{n} \left[1 - \lambda\left(\sigma(\xi_t)/E(\xi_t)\right)\right] E(\xi_t)(1+i)^{-t} = \sum_{t=1}^{n} E(\xi_t)(1+i)^{-t} - \lambda \sum_{t=1}^{n} \sigma(\xi_t)(1+i)^{-t}. \tag{6}$$

Observe that, in this procedure, the subjectivity is translated to the parameter λ which makes the choice of the values of α_t easier. This is because the coefficient of variation of the random variable ξ_t indicates the uncertainty level inherent to the random amount ξ_t.

3. Deforming the Discount Function

The deformation of the discount function consists in modifying some of the parameters which define it, in particular, the interest rate (*i*) and/or the cash flows maturities (*t*). The implementation of these correcting parameters to introduce the inherent risk in an investment project implies its treatment as a whole.

In order to use the method of deforming the discount function we adopt the following reasonable hypothesis: the cash flows with higher maturities have higher risk with respect to those whose time horizon is closer. In general, this premise is true since the closer cash flows, usually, may be estimated with a accuracy higher than those with a later maturity, period during which a larger quantity and variety of contingencies may happen.

In this way, this methodology cannot be employed to assess those random investments whose initial cash flows are more difficult to estimate than the later ones; this is because most contingencies are expected at the beginning of the investment. This is, for example, the case of the exploitation of certain types of plantations, whose initial cash flows are very volatile. In effect, at the beginning of the cultivation, the risks are higher because of the seed germination and the initial development of the plant (Van Horne, 2001).

In spite of this limitation, deforming the discount function is a consolidated method. Given its importance in the analysis of financial transactions and in the project assessment, we are going to recall the main procedures to deform the discount function: modifying the interest rate with an additional premium and using a divisor, and modifying the maturities of cash flows.

3.1 Introducing an Additional Risk Premium to the Discount Rate

Modifying the discount rate in the expression of a discount function is one of the most used methods to assess certain investments in a context of uncertainty. The procedure presented in this paragraph adds a risk premium, denoted by *p*, to the interest rate, giving rise to a new discount rate:

$$i^{*} = i + p. \tag{7}$$

This premium has to be positive and its value must be directly related with the risk inherent to the project (Sapag & Sapag, 2014; Bodie & Merton, 2000). Under these conditions, the modified net present value is the following:

$$NPV^{*} = -I_0 + \sum_{t=1}^{n} E(\xi_t)(1+i+p)^{-t} \tag{8}$$

As expected, NPV^* is smaller than *NPV* and this is logical since its mathematical expression includes the transaction risk in the discount rate.

3.2 Introducing a Divisor of the Discount Rate

This method is a multiplicative version of introducing an additional risk premium to the discount rate, and it consists in applying a correcting denominator, *z*, to the discount rate, *i*, given rise to a new rate discount:

$$i^* = i / z, \tag{9}$$

where *z* is a value between 0 and 1, inversely related with the transaction risk. Under these conditions, we can calculate the modified net present value of the uncertain future cash flows by using the new discount rate, remaining:

$$NPV^* = -I_0 + \sum_{t=1}^{n} E(\xi_t)(1+i^*)^{-t} = -I_0 + \sum_{t=1}^{n} E(\xi_t)\left(1+i/z\right)^{-t}. \tag{10}$$

As expected, NPV^* is smaller than *NPV*.

3.3 Introducing a Multiple of the Cash Flow Maturities

An alternative way to include the risk in the discount function is to use a factor, *u*, which modifies the maturities of cash flows:

$$t^* = ut \tag{11}$$

where *u* is a parameter greater than 1, directly related with the transaction risk.

As *u* increases, the expected maturities of the transaction are further. Thus, the discount function value decreases and hence the corrected net present value of the expected future cash flows also decreases:

$$NPV^* = -I_0 + \sum_{t=1}^{n} E(\xi_t)(1+i)^{-ut}. \tag{12}$$

3.4 Relationship between the Parameters of the Correcting Methods

The methodologies presented in subsections 3.1, 3.2 and 3.3 present a common disadvantage: their high degree of subjectivity to quantify the value of the considered element of risk. Its determination is based on the preferences and the own experience of an expert.

The key difference between them is that the introduction of the risk in the discount function considers the project as a whole, whilst the criterion based on the use of correcting coefficients considers different coefficients for every cash flow, according to their own characteristics. However, modifying the discount function is the most suitable method to introduce the risk if the future cash flows are correlated between them (Suárez, 2013).

In Table 1, we are going to show the mathematical relationship between the modifying parameters of the discount function and the correcting coefficients of the expected cash flows.

Table 1. Relationship between all correcting parameters.

Parameter	p	z	u
α_t	$\alpha_t = \frac{(1+i)^t}{(1+i+p)^t}$ $\alpha_{t+1} = \alpha_t \frac{1+i}{1+i+X} < \alpha_t$	$\alpha_t = \frac{(1+i)^t}{(1+i/z)^t}$ $\alpha_{t+1} = \alpha_t \frac{1+i}{1+i/z} < \alpha_t$	$\alpha_t = (1+i)^{(1-u)t}$ $\alpha_{t+1} = \alpha_t (1+i) > \alpha_t$
p		$p = \frac{i}{z} - i$	$p = (1+i)^u - (1+i)$
z			$z = \frac{i}{(1+i)^u - 1}$

Observe that most cases in Table 1 imply that the correcting coefficients α_t are decreasing which does not seem a reasonable assumption.

4. Modifying the Time in the Expression of the Discount Function

4.1 Introduction

As indicated, the methodologies implemented in Section 3 lead to unrealistic properties of the respective correcting parameters of cash flows except when using a multiple of the cash flows maturities. The model we are going to present in this Section is based on this last methodology (presented in Section 3.3) and is developed in order to lead to a more accurate result. In effect, in this novel approach the risk is based on the creditor perception about obtaining the future cash flows. More specifically, the risk is measured through the delay in the receipt of the cash flow with respect to the initially agreed maturity. Therefore, the delay in the payment of debts to creditors will be considered the main indicator of the risk inherent to a project.

In this way, our model to introduce the risk is based on the use of the expected maturities (s) of cash flows instead of the initially agreed ones (t) in the project. This new model will imply a smaller value of the discount function used in the assessment of the *NPV* of the project. Thus, the delay in payment, denoted by r, is defined as:

$$s := t + r. \tag{13}$$

Therefore, our aim is to derive the relationship between the debt maturities (t) defined before starting the project, and their corresponding expected delays (r). To do this, we are going to use the information provided by Intrum Justitia included in the "Payment Report 2015". This report presents the average payment maturities that have been contractually agreed and the average time that customers actually take to pay. The information is presented for private (Business-to-Consumer and Business-to-Business) and public companies in Spain. The average maturity data for each of these types of companies are as follows:

1) Business-to-Consumer (B2C) companies:
    a. Average contractual payment in days: 43.9.
    b. Average time that customers actually take to pay: 45.
2) Business-to-Business (B2B) companies:
    a. Average contractual payment in days: 56.
    b. Average time that customers actually take to pay: 69.5.
3) Public companies:
    a. Average contractual payment in days: 70.4.
    b. Average time that customers actually take to pay: 103.

4.2 The model

Krugman's curve (see Figure 1) relates the maturities of the external debt of a country with the expected dates of its creditors to be reimbursed.

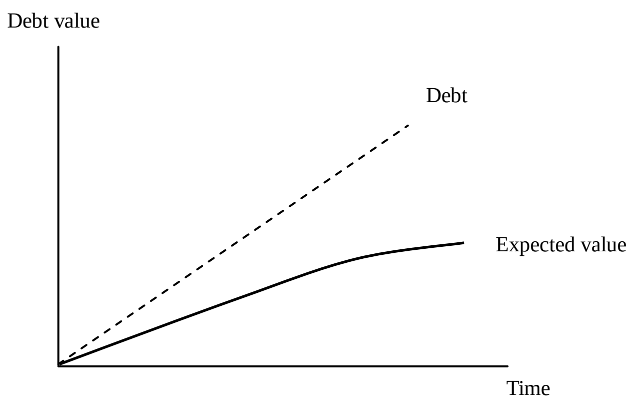

Figure 1. Krugman's curve

The Krugman's curve explains, in the context of the external debt of a country, how the increase of the external debt of a country also leads to an increment of its expectation of its creditors to be refunded. This increment is declining, as debt maturities increases (Flores et al., 2007).

Below, we conduct an adaptation of the Krugman's curve to explain the relationship between debt maturities of a company and the corresponding expectations to be obtained. To do this, we have to take into account that the future debts are cumulative over time whereby they exhibit an increasing trend as shown in Figure 2:

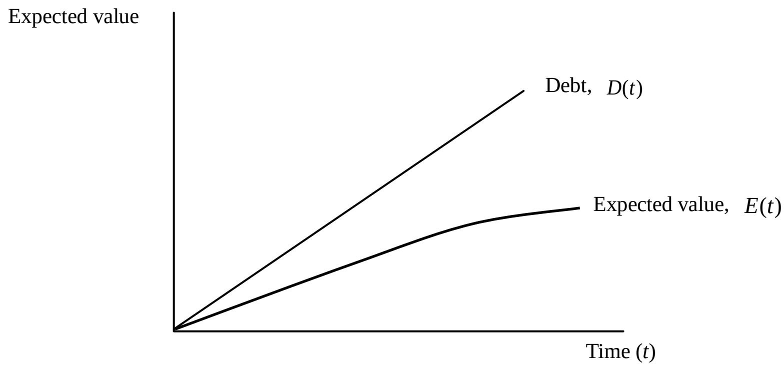

Figure 2. Krugman's curve adaptation

From the graphical representation, it is clear that the expectation of obtaining the debt amounts increases less than such debt values, as time increases.

More specifically, from the creditor point of view, the company owes an amount that increases linearly with time. Whilst the debt expected value (concave function) is also increasing, this rise has a decreasing trend. This is because the events in the distant future are more difficult to prevent, which results in higher risks. Thus, greater maturities imply greater reductions in payment expectations.

On the other hand, we are going to assume that the company debt follows a density function with quantity d(x), where $0 < x < \infty$:

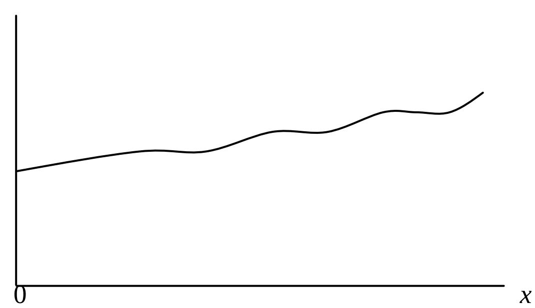

Figure 3. Density function of the debt amount according to time

Therefore, the expression of the interest-free cumulative debt is as follows:

$$D(t) = \int_0^t d(x)dx, \tag{14}$$

that, in general, is not a straight line. However, for simplicity, we will consider the linear case, as previously indicated. Its graphical representation is:

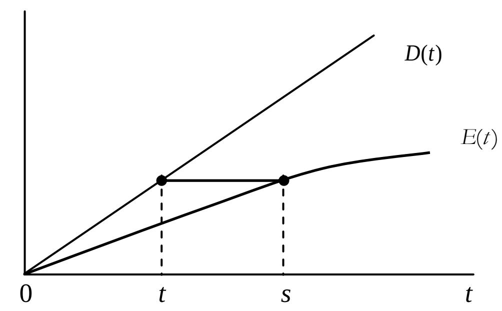

Figure 4. Cumulative debt and payment expectations

The creditor has accumulated at time *t* an amount of debt to be received, $D(t)$, but this is not expected to be obtained until later, *s*, as seen in Figure 4. So, the following equation holds:

$$D(t) = E(s). \tag{15}$$

At the beginning of the project (instant 0), we assume that $D'(0) = E'(0)$ which means that the initial instantaneous rate in the debt payment by the debtor is equal to the initial instantaneous rate in the total debt. Our proposal is that, in accordance to Krugman's model, the total debt has a linear evolution whilst the expectation of receipt has a logarithmic behavior (Cruz & Sánchez, 2013). In effect, suppose that:

$$D(t) = dt \tag{16}$$

and

$$E(t) = \ln(1 + \beta t). \tag{17}$$

At instant $t = 0$:

$$D'(0) = d. \tag{18}$$

And

$$E'(0) = \beta. \tag{19}$$

According to Equation (15), one has:

$$d = \beta \tag{20}$$

and

$$dt = \ln(1 + \beta s). \tag{21}$$

Therefore,

$$s = \frac{e^{\beta t} - 1}{\beta}. \tag{22}$$

By using the expected time, *s*, instead of the initially agreed time of the project, *t*, in the exponential discount function, it remains as follows:

$$F(t) = \exp(-ks) = \exp\left\{-k\,\frac{\exp(\beta t) - 1}{\beta}\right\}. \tag{23}$$

Observe that the instantaneous discount rate of this new discount function:

$$\delta(t) = -\frac{\mathrm{d}\ln F(t)}{\mathrm{d}t} = \frac{k}{\beta}\exp(\beta t) \tag{24}$$

is, as expected, increasing. Finally, to obtain the value of the constant parameter, β, in an objective way, we change the initially agreed expirations to the expected maturities. To do this, we use the current information (average contractual payment in days and average time that customers actually take to pay) provided by Intrum Justitia in the "Payment Report 2015", which gives place to the following value of β depending on the type of company:

- $\beta = 0.00112$ for Business-to-Consumer (B2C) companies.

- $\beta = 0.00745$ for Business-to-Business (B2B) companies.
- $\beta = 0.01021$ in the case of public companies.

5. Conclusions

In order to determine the net present value of an investment project, it is necessary to use some adjustment criteria able to forecast the expected cash flows maturities according to the degree of risk that the project involves.

First, once recalled the different methods employed to introduce the risk in the assessment of an investment project, the relationship among them have been summarized. Then we have developed a new, more objective methodology to include the risk when determining the NPV of an investment. The presented model relates the risk inherent to a project with its maturity based on the expectation that the creditor has about obtaining the corresponding cash flows. Therefore, in this work, the risk has been identified to the delay of the maturities of the cash flows involved in the project. In this way, this new model uses, in the expression of the discount function, the expected maturities rather than the due initially agreed dates.

Our methodology is based on an adaptation of the Krugman's curve from which we are able to derive a relationship between the maturities involved in a project and their respective delays. This treatment of risk represents a new point of view in the assessment of investment projects where some of their parameters (cash flows or interest rate) are uncertain.

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The Econometric Estimation of Macroeconomic Effect of Financial Development on Economic Growth in Cote d'Ivoire: A Long and Short Run Analysis, 1970-2014

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Abstract

The aim of this article was to investigate empirically the link between financial development and economic growth in Cote d'Ivoire using time series data covering the period of 1970-2014, both in short and long run. The Error correction model and cointegration method were performed to capture the short and long run dynamics of this relationship respectively. The cointegration test result showed evidence of long-run and significant causal between financial development and economic growth in Cote d'Ivoire during the study period. Furthermore, the coefficient of the error correction term (ECT) in the short-run dynamic model was statistically insignificant with inappropriate sign and weak. Consequently, the empirical evidence suggests that countries authorities should promote domestic private credit to boost liquidity level to ensure long-term price stability and strengthen local industries production capacities.

Keywords: financial development, economic growth, financial system, Cote d'Ivoire

1. Introduction

For more than a century, economists have been debating the important relationship between finance and growth. The key issue centers on whether and how a well-functioning financial system could promote long-run economic growth. By the end of 1990s, many Sub-Saharan Africa (SSA) developing economies such as Cote d'Ivoire have adopted many reforms in order to liberalize financial sector. Between 1987 and 1988, the scale of the imbalances forced the state to sign an agreement with the IMF in view of implementing a financial stabilization plan from July 1989 to December 1990 with the aim of: (i) producing a positive primary balance of trade of at least 5% in 1993, (ii) covering an increasing share of the foreign debt in order to (iii) restore the frozen relations between Côte d'Ivoire and its creditors, and finally (iv) to gradually resolve the payment arrears that had been accumulated between 1987 and 1989 (Barry, 1991). The objective of these main reforms was to accelerate privatization companies in order to reduce government spending. Also, since the end of the 1999s Côte d'Ivoire has been embroiled in a series of armed conflicts. Political instability reigned from the putsch of December 1999 to the unsuccessful coup d'état on 19 September 2002, which turned into an armed rebellion that split the country in two, interspersed with spiraling violence (Akindès, 2004; 2009). The economic recovery after Cote d'Ivoire's 2010 post-election crisis was vigorous. Following a fall in real GDP of 4.4% during the conflict in 2011, the well functioning of public institutions and economic activities has jumped nearly 11% growth in 2012. That dynamic is maintained in a range of 8 % until mid- 2014 according to the latest estimates. That significant jump is possible thanks to the increasing domestic including consumption but mostly investment with a strong response to private sector. From the demand side, real economic growth was driven by a dynamic vigorous national absorption, powered the noticeable recovery of investment associated with large public programs infrastructure rehabilitation. At the same time, the effect of the decline in net exports Growth has been less felt during 2013 (Figure 1).

The last estimates show a significant continuation gain in the retail trade in 2014. Investment has peaked at 14.6% of GDP in 2013, compared to 12.1% in 2012, thanks to the realization of public investment for the rehabilitation of infrastructure and an increase of private investment to expand mining and oil sectors capacity. Indeed, the level of remarkable public investment spending is specific to this episode of recovery after the conflict. The industrial sector recorded strong growth of 8.8 % in 2013, following a decline of 1.4% the previous year. The industrial production experienced more modest progression 4.7 % over the year to the mid-2014. The increase in private consumption was supported by job creation in the formal private sector and the public sector;and a 17.4% increase in real incomes of coffee and cocoa planters also boosted household demand. With normalization of the political situation, and primer an economic recovery underway, hiring in the private sector (4.8% increase in jobs) and public sector (+ 4.5%), resulting in overall increase in formal employment by 5% in 2013. Total public spending remained unchanged at 22.1% of GDP in 2013. However, we note a change in the composition of public expenditure, with strong increased of capital expenditures and a decrease in expenses. The Investment expenses increased by compared to 2013 reach 6.1% of GDP (against 4.5% in 2012), due to public works and other infrastructure improvement projects. However, investment spending still below planned levels (7.2% of GDP), reflecting delays and some weaknesses in the implementation of the public investment program.

Although the recent spectacular growth, this paper seeks to find response to this question: This fast growth will be consolidated in long run? The rest of this study is organized as follows: Section 2 deals with literature review. Section 3 outlines the model specification and estimation methods then we also describe the source of our selected data and measurement. Section 4 highlights the econometric analysis and interpretation of the empirical results both in short and long run. It is followed by the summary, policy discussions and conclusions, respectively in Section 5.

2. Literature and Empirical Framework

Several theoretical studies have attempted to substantiate how financial development can stimulate economic growth. (Schumpeter, 1912) argued that the well functioning of banks stimulates technological innovation and accelerate growth. (Levine, 2005) emphasizes that financial intermediaries through five functions they play, stimulate growth through capital accumulation and factor productivity. These five functions cover the production of information on the projects and the allocation of resources to the most profitable projects; investment monitoring and control on business management; facilitation of financial and commercial transactions, and improving risk management; the mobilization of savings and; the facilitation of trade in goods and services.

Many theoretical and empirical studies have sought for decades to explain the relationship between financial development and economic growth. Indeed, economists have long disagreed on the role of the financial sector in economic growth. Most of them, including winners of Nobel Prize in Economics including Robert Lucas (1988), had rejected the idea of a major role of financial development on economic growth. Thanks to several research, other economists whose (Goldsmith, 1969), blew open the idea that one can ignore the link between financial development and growth without substantially impeding our understanding of the process of economic growth (Levine, 2005). However, different views, even contradictory, are born from the interpretation of the results of this work. Some argue that financial development is essential to growth, while others say it is economic growth that determines the level of financial development of a country. Moreover, it should be noted that although most studies find evidence of a positive correlation between financial development and growth, a number of researchers provide evidence contrary to this assertion. In this section, we first review the results corroborating a positive relationship between finance and growth and then we will examine the controversy surrounding this literature. Including the empirical literature on the relationship between financial development and economic growth has boomed since the work of (King & Levine, 1993). Although (Levine, 2005) attributes the first study establishing the empirical link between finance and growth to (Goldsmith, 1969), (King & Levine, 1993a) has validated several endogenous growth models such as (Greenwood & Jovanovic, 1990), (Bencivenga & Smith, 1991) and (St. Paul, 1992) in particular.

Ross Levine in an article entitled Financial Development and Economic Growth: Views and Agenda 1997 adopts a functional approach “to try to explain theoretically, by what mechanism financial system affects economic growth King and Levine (1993a) were the first authors to make an empirical analysis. They took a sample of 77 countries over a period from 1960 to 1989. They regressed the average growth of gross domestic product (GDP) per capita or the average growth of Total Factor Productivity (TFP) on financial development and control variables. The control variables include the initial income per capita, education, political stability and economic policy indicators. King and Levine show substantial and significant correlation between productivity growth and the measures listed above. Similar results corroborate a positive relationship between financial development and economic growth have been obtained by other researchers as (Rajan & Zingales, 1998), (Demirgucs-Kunt & Maksimovic 1996a; 1996b). (Rajan & Zingales, 1998) find that by reducing the financing cost for those industries which rely more on external finance, more developed financial systems could promote faster industrial growth and therefore faster economic growth while (Demirgucs-Kunt & Maksmovic, 1996a; 1996b) also argue that firms with access to well-developed financial markets grow comparatively faster.

After the work of King and Levine (1993a) inspired the assertion of (Schumpeter 1912), several studies have examine the extent of the relationship between financial sector and growth by questioning (Schumpeter, 1912) empirical results in other words, the direction of causality between financial development and economic growth. In the opinion of some of these authors, financial development is not prior to economic growth, but rather the opposite. Among those supporting the controversy include the contributions of (Arestis & Demetriades, 1996) which show that when the correlation between financial development index has taken the average and its initial level is strong, financial development predicts more economic growth. These arguments are at the origin of the ambiguity on the direction of causality in the relationship between finance and growth. Furthermore, most studies on the analysis of the link between finance and economic growth measures were focused on the banking system thus obscuring part of financial development namely that linked to the rise of the financial markets. Thus, to better reflect the financial development in the country, some studies incorporate indicators to measure the size and liquidity of financial markets. The work of (Levine & Zervos, 1998) and (Beck & Levine, 2002) provide evidence that the development of financial markets is an indicator that allows a better understanding of the economic growth process.

3. Model Specification, Investigation Methodology Applied Data Sources and Measurement

3.1 Specification of Our Model

In this paper, we use the econometric performed by Levin (1997) to investigate the macroeconomic effect of Financial Development on Economic Growth in Cote d’Ivoire both in long and short run analysis spanning the period 1970 to 2014. Therefore our econometric model is expressed as follow:

$$RGDPg_t = \beta_0 + \beta_1 FDL + \beta_2 MPR + \beta_3 TOP + \beta_4 INF + \beta_5 EXR + \varepsilon_t \quad (1)$$

Where:

RGDPg= Real gross domestic product growth rate;

FDL= Ratio of total money supply to GDP as financial liquidity.

MPR= Monetary policy rate proxy by interest rate;

TOT= Trade openness as ratio of total trade to GDP

INF= Inflation rate

EXR= Exchange rate of CFA vis-à-vis EURO;

β_0 = Intercept or constant

We expected to have the following sign of our coefficients as follow: β_1, β_3 › 0, β_2, β_4, β_5 ‹ 0. It attempt to find out whether the independent variables have significant influence on dependent variable or not, that is β_i is significantly equal to zero or not. Mathematically, this hypothesis can be written as:

$H_0 : \beta_i = 0$

$H_1 : \beta_i \neq 0$

3.2 Investigation Methodology Applied

In this subsection, we first need ensure that all variables are stationary to avoid the spurious regression problem associated with unit roots. So the unit root tests on relevant economic variables are performed in order to determine time series characteristics. This study uses the Augmented (Dickey-Fuller, 1979) and (Phillip-Peron, 1988) unit root tests for presence of unit root. Second, the long run relationship between macro-variables is conducting using (Johansen, 1988) and (Juseluis, 1990) cointegration test. Finally, the Error Correction Model (ECM) is running because it produces good forecasts in short run Lesage, (1990).

3.3 Data Sources

Our data sources are selected from the World Development Indicators published (2015) by the World Bank covering the whole period 1970 to 2014. Where RGDP is Real gross domestic product growth rate, FDL represents the ratio of total money supply to GDP as financial liquidity, MPR is monetary policy rate proxy by interest rate, TOT is trade openness ratio of total trade to GDP, EXR is exchange rate of CFA vis-à-vis EURO and the consumer price index as a proxy of inflation rate is depicted by INF.

4. Empirical Results and Interpretations

4.1 Empirical Results

A descriptive analysis of the data which are presented in table 1 was conducted. Usually normally distributed variables give better results than variables which are not normally distributed. The table presents the normality test of the variables. It was found that some of the data are not normally distributed as shown in the table 1 below. All variables exhibit a positive mean return excepted real gross domestic product growth rate(*RGDP*) because higher fluctuation during the study period. Also the sum squared deviation row represents the net change over the sample period. In terms of skewness, financial liquidity (*FDL)*, Interest rate (*MPR) and Real* Exchange rate *(EXR)* have return distribution that are positively skewed. *RGDP* and trade openness *(TOP)* exhibit a negative skewness which implies that they have a long left tail. All the variables are relatively normally distributed as indicated by the p values of Jarque Bera statistic.

Table 1. Summary of the descriptive statistic of the data

	RGDP	FDL	MPR	TOP	INF	EXR
Mean	-1.214872	28.77464	10.59899	74.01475	6.430499	121.6473
Median	-0.692174	27.91525	9.939500	74.51004	4.313954	108.8841
Maximum	7.850099	40.45515	50.90934	94.90811	46.38607	166.7861
Minimum	-14.86414	21.67547	-26.73006	10.27535	-4.523274	90.89341
Std. Dev.	4.338930	4.896544	14.85355	14.58837	9.572000	26.87915
Skewness	-0.420368	1.012972	0.992931	-1.743785	2.255060	0.967099
Kurtosis	3.825073	3.675131	4.931248	9.180690	8.736234	2.227422
Jarque-Bera	2.601717	8.550476	14.38757	94.43266	99.83545	8.133745
Probability	0.272298	0.013909	0.000751	0.000000	0.000000	0.017131
Sum	-54.66926	1294.859	476.9545	3330.664	289.3725	5474.127
Sum Sq. Dev.	828.3579	1054.950	9707.634	9364.101	4031.420	31789.51
Observations	45	45	45	45	45	45

Source: Own calculation using data from regression analysis.

Second, we perform unit root test to verify the stationarity of our variables by utilizing the univariate Augmented Dickey-Fuller (*ADF*) and Phillip-Peron (PP) unit root tests procedure. The results are reported in Table 2 bellow. The overall test shows that we fail to reject the stationary null hypothesis base on *ADF* and *PP* test at level excluded real gross domestic product growth rate (*RGDP*). Thus, according the empirical foundation, we conclude that all variables follow the *I*(1) process. Beyond testing for the unit root, there is a need to establish whether the non-stationary variables are cointegrated so we follow the method developed by Johansen (1988) and Juselius (1990) to test for the presence of equilibrium relationship between economic variables. The concept of cointegration implies that, there is a long run relationship between two or more non-stationary variables. Table 3 displays the results.

Table 2. Univariate unit root tests

Test variables	**ADF Statistics**		**PP Statistics**	
Level	Trend	No Trend	Trend	No Trend
LnRGDP	-5.205***	-1.218	5.211***	-2.143**
FDL	-0.918	0.834	-0.784	0.934
MPR	-0.737	0.848	-0.586	0.939
TOT	-2,047	0.410	-2.082	0.388
INF	-2,523	4.715	-2,068	3.900
EXR	-2,273	-0.469	-2.387	-0.438
		First Difference		
Δ *LnRGDP*		-9.708***	-20.824***	
Δ *FDL*	-6.684***	-6.263***	-6.682***	-6.243***
Δ *MPR*	-6,657***	-6.182***	-6.658***	-6.168***
Δ *TOT*	-5.294***	-5.287***	-5.277***	-5.289***
Δ *INF*	-4.219**	-2.793***	-4.219***	-2.727**
Δ *EXR*	-5.743***	-5.941***	-5.757***	-5.966***

Source: Own calculation using data from regression analysis.

The Δ denotes first-difference derivation. The asterisks *, **, and *** denote statistical significance at 1%, 5%, and 10% levels, respectively. McKinnon (1980) critical values are used for rejection of the null unit root.

Fourth, after getting the long-run cointegration relationship using (Johansen, 1988) and (Juselius, 1990) procedure, the error-correction model (ECM) can be expressed and estimated with a more appropriate dynamic simple. Thus, an error correction term lagging one period error-correction term (ECT_{t-1}) is carry out to capture the long run relationship by attempt to correct deviations from the long run equilibrium path. Its coefficient can be interpreted as the speed of adjustment or the amount of disequilibrium transmitted each period to amount of real gross domestic product growth rate (*RGDP*) with appropriate lag order $k = 6$ for the periods 1970-2014.

4.2 Interpretation of Empirical Results

In so doing, we performed univariate augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) unit root tests for each variable that enters the multivariate model. The results over the period 1970-2014 reported in Table 1 fail to reject the null hypothesis at level based on the tests mentioned above. But the overall tests shows that all the variables are stationary at first difference and treated as integrated *I(1)* process according the literature while RGDP is stationary at levels.

Turning to the long-run analysis, we performed the cointegration test using (Johansen, 1988) and (Juselius, 1990). The result demonstrated that real gross domestic product growth rate(*RGDP*) financial liquidity (*FDL)*, Interest rate (*MPR)*,trade openness *(TOP)*, inflation (*INF*) *and Real* Exchange rate *(EXR)* are cointegrated at the 5% level of significance. Both the maximum eigenvalue (λ_{max}) and the trace statistics (λ_{trace}) tests identify a unique statistically significance vector with (λ_{max} = 66,921; λ_{trace} =143,048) see Table 3. Second, the long run estimated result for the multiple parameters regression specified to capture the effect of financial development on economic growth in Cote d'Ivoire between 1970 and 2014 presented in Table 4 reveals that financial development as a measure financial liquidity (FDL) in economy proxy by ratio of total money supply to gross domestic product, Monetary policy rate proxy by interest rate(MPR), inflation rate (*INF*) and exchange rate (EXR) have positive and inelastic effect on economic growth proxy as changes in real gross domestic product (RGDP) Cote d'Ivoire during the study period. But trade openness (TOP) a measure of economic integration/ globalization, inflation rate (INF) and exchange rate (EXR) show negative and positive sign respectively effect during the same period. These effects are conformed to our theoretical expectation excluding inflation rate and real exchange rate. The results show that all estimated parameters are statistically significant at the standard level 1%, 5% and 10% excluding trade openness. The obtained R^2 in the model of 0.483 implies that the explanatory variables included in the model explain more than 48 percent of all variations in growth performance. The Probability of rejecting the model specification given by Prob (F-statistics) of 0.000065 reflects that the model is well specified. In case the model is adjusted the R^2 will be reduced to 41.7 percent, which is still preferable in explaining the model variation and thus according to the result we can accept the null hypothesis that the growth performance of the country follow the long run process. We check the stability of our model by computed the CUSUM and CUSUMQ square (Brown & Durbin, 1975). The cumulative sum of residuals plot is reported in figure 1. These show that the general equilibrium of our model is quite stable in long run.

Table 3. Johansen cointegration test (sample 1970-2014)

Null Hypothesis	Alternative Hypothesis	Eigen Value	LR/Trace Statistics (λ_{trace})	Critical value 5% level (*C.V.*)	Maxi-Eigen Statistics (λ_{max})	Critical value 5% level (*C.V.*)
r=0	r=1	0.785	143.048	107.346	66.29160	43.419
r ⩽1	r=2	0.606	76.756	79.341	40.15234	37.163
r ⩽2	r=3	0.373	36.604	55.245	20.08335	20.815
r ⩽3	r=4	0.207	16.521	35.010	10.00170	0.903
r ⩽4	r=5	0.106	6.519	18.379	4.840873	0.913
r ⩽5	r=6	0.038	1.678	3.841	1.678516	0.195

Source: Own calculation using data from regression analysis.

Table 4. Estimated regression model in long run

Dependent Variable: RGDP				
Method: Least Squares				
Sample: 1970-2014				
Variables	**Coefficients**	**Std Error**	**T-Statistic**	**Probability**
C	*4.903*	*4.041*	*1.213*	*0.232*
FDL	*0.255****	*0.117*	*-3.262*	*0.000*

MPR	*-0.013****	*0.052*	*4.819*	*0.723*
TOP	*-0.354*	*0.038*	*-0.356*	*0.0001*
INF	*0.045****	*0.078*	*-4.511*	*0.032*
EXR	*0.045****	*0.020*	*2.222*	*0.232*

Source: Computation from data used in Regression Analysis.

Note: $R^2 = 0.483$ imply that the model is good fit. F-test result indicates the overall significance of the model. The asterisks ***, ** and * implies statistically significant at 1%, 5% and at 10% level respectively.

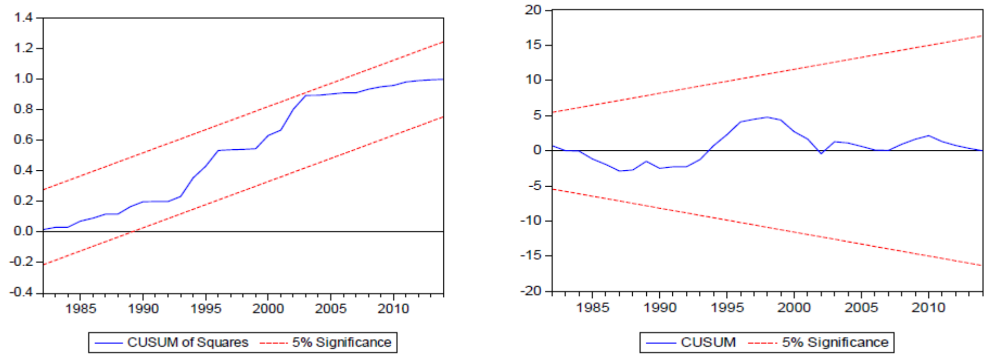

Figure 1. Plot of cumulative sum of squares of recursive residuals for CUSUM 5% significance and CUSUM of squares 5% significance

Third, we analyze the short run dynamic effect by performing the error-correction model (ECM) and can be expressed and estimated with a more appropriate simple dynamic representation. Results on Table 5 represents the estimation of the over parameterized model as well. As shown in the general model, most of the insignificant variables whose T-Statistics is less than 2, have been eliminated without losing valuable details and will not appear in the preferred model. The only significant variables (whose T-Statistic is greater than or equal to 2) will be appearing in the preferred model as it is shown in Table 5. Following the dropping out of insignificant variables in the general model without losing valuable information; the short-run dynamics of real gross domestic product (RGDP) function is analyzed by computing an error-correction model (ECM) with lags length (k = 6) and report a significance F-test statistics which implying that there is an improvement in the overall significance of the model. The result also displays an incorrect sign (positive) not meaningful and relatively higher (ECT_{t-1}) coefficient (0.053380). This implies that macroeconomic effect of financial development on economic growth in Cote d'Ivoire is weak in short run.

Table 5. Estimated regression model in short run

Dependent Variable: RGDP				
Method: Least Squares				
Variables	**Coefficients**	**Std Error**	**T-Statistic**	**Probability**
C	11.24178	4.623222	2.431589***	0.0511
DFDL(-5)	-1.881470	0.833314	-2.257817***	0.0647
DMPR(-1)	-0.298642	0.148241	-2.014565***	0.0906
DMPR(-6)	-0.310254	0.118883	-2.609740***	0.0401
DTOP(-6)	0.133239	0.063146	2.110008***	0.0794
DINF(-1)	0.398080	0.163651	2.432494***	0.0510
DEXR(-1)	-0.233110	0.081597	-2.856830***	0.0289
DEXR(-4)	-0.120801	0.058353	-2.070185***	0.0839
ECT(-1)	**0.053380**	0.021285	2.507893***	0.0460

Source: Computation from data used in Regression Analysis.

Note. $R^2 = 0.944$ imply that the model is good fit. F-test result indicates the overall significance of the model. The asterisks ***, ** and * implies statistically significant at 1%, 5% and at 10% level respectively.

5. Conclusion

The main objective of this paper was to analyze the effect of financial development on economic growth in Cote d'Ivoire using the recently time series data covering the period of 1970-2014. Unit root test was conducted to test the stationary of data and cointegration test was performed to test for the existence of the long-run relationships of the variables. In the same way, our model was generated from overparameterized, based on statistic rather economic by the error correction model. Finally, according the importance of the stability in the regression analysis of the model, we run the stability test to check whether our regression was stable at the conventional significance level. The Johansen (1988) and Juselius (1990) test confirm the presence of a long run cointegrating relationship among the variables used for this study. The estimated model results revealed that economic growth is inelastic of financial development and other macroeconomic indicators in Cote d'Ivoire in long run. In addition, the study also shows that financial liquidity and interest rate have long run significant impact and seem to be the main determinant of the country's growth during the study period. On the basis of our empirical output, the study suggests that countries authorities should promote domestic private credit to boost liquidity level and expand the financial sector base in the domestic economy to ensure long-term price stability and promote output. Therefore, this study concludes that financial development has insignificant and weak effect on the Cote d'Ivoire's economy in short run.

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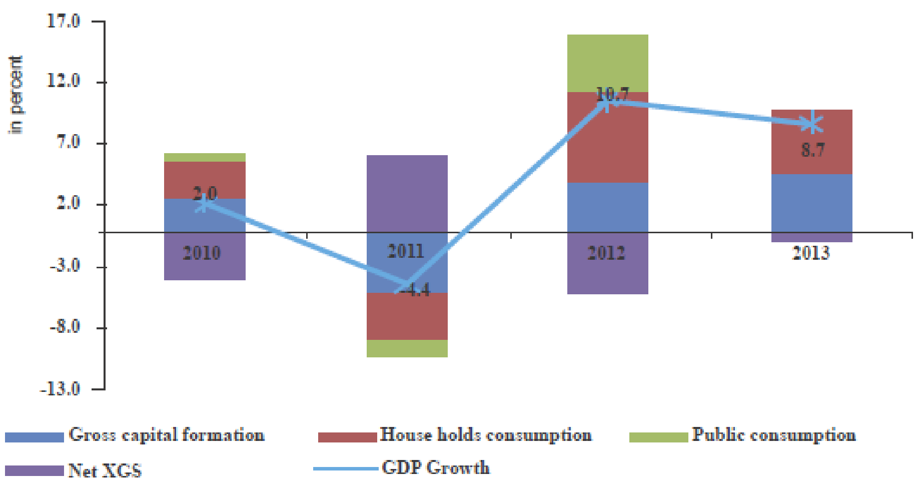
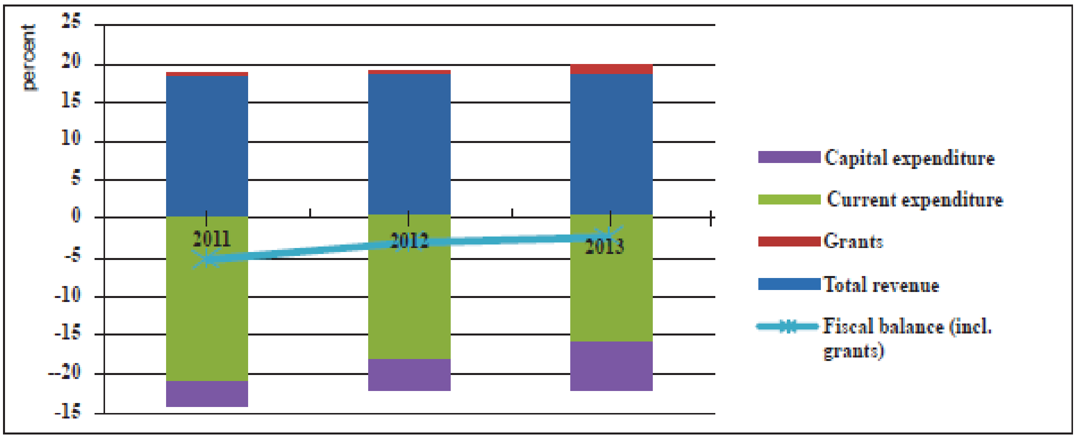
Appendix



Appendix 1. Growth categories of real expenditure, 2010-2013

Source: Ministry of Economic and Finance of Cote d'Ivoire.



Appendix 2. Decomposition of budgets variables as a percentage of GDP, 2011-2013

Source: International Monetary Fund's (IMF).

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Analysis on the Input-Output Relevancy between China's Financial Industry and Three Major Industries

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Abstract

Finance is the core of modern economy, which plays an important role of allocating the resources and regulating the economy. The input-output table of China in 2007 and 2010 will be integrated into a simple form which includes primary industry, secondary industry, tertiary industry and the financial industry in this paper. Through the analysis on the direct dependency, complete dependency, spread effect and intermediate input rate and output rate, this paper investigates the relevancy between China's financial industry and three major industries. It is concluded that although China's financial industry develops rapidly, its status and role in the national economy is not outstanding. And this paper gives some suggestions for the development of the national economy, including developing the tertiary industry, promoting the structure upgrade of secondary industry and speeding up the cultivation of financial talents to promote the development of the financial industry.

Keywords: financial industry, three major industries, input-output analysis, industry relevancy, spread effect

1. Introduction

1.1 Research Background and Significance

Finance is the core of modern economy, which plays an important role of allocating the social resources and regulating the national economy. Its level of development and industrial structure directly affect the degree of a country's economic stability.

In 2007, the outbreak of the financial crisis swept across the whole world in an unprecedented situation, greatly impacting the distribution pattern of global finance. How to coordinate the relationship between the financial industry and the other industries once again aroused the attention of the whole world. Each country took the structure upgrading of financial industry and the construction of smooth financing channels as the dominant theme of the national economy.

Financial industry connects between each social industry. On the one hand, the production of each industry needs financial services; On the other hand, the financial industry as a high debt industry, its development also needs support from the real economy. Therefore, there are not only direct links between the financial industry and the other industries, but also lots of indirect links between each other.

China's financial industry develops relatively late, so there are considerable gaps in the level of development and the rationality of industrial structure with developed countries. There are some defects in the development of China's financial industry, such as diseconomies of scale, imbalance of industrial structure and lacking an enough role of promoting the national economy. China is in the stage of economic transition, so how to grasp the opportunity to improve the industrial structure of the financial industry and strengthen its role of promoting the other industries has become a very important task.

Therefore, using the method of input-output analysis to analyze the relevancy between the financial industry and three major industries not only has the theoretical support, but also has a very important practical significance.

1.2 Literature Review

Economist Wassily Leontief (1936) established the input-output model and used it to study the input-output relevancy between the various industries in a country's economic system. In the 1960s, British professor John

Richard applied the input-output method in the study of financial industry for the first time. John Richard made the input-output table of financial industry and used it to study the financial links between various industries.

Based on the research in foreign countries, China's input-output research began in the 1960s and the input-output table was compiled every five years since 1987. Shou-yi Zhang (1988) compiled an embedded input-output table to analyze the impact of the optimal structure on each national economic sector. Xi-kang Chen (1991) compiled the "input-occupancy-output table on China's urban and rural economy", adding the vector of production factor to make the table contain more information. Zhan-qi Yao (2005) studied the industrial relevancy between the financial industry and the secondary industry, together with the tertiary industry in China. And he made a comparison of China's financial industrial relevancy between the developed countries, finding that the financial industry is closely related to the service industry in the developed countries, while is closely related to the manufacturing industry in China. Ming Li (2010) used the input-output table in 2007 in Anhui province to analyze the role of the financial industry to the development of the economy in Anhui province and found that the financial industry was not widely involved in other industries, especially the secondary industry. Mei-dong Qi (2011) used the input-output model to prove the important promotion of the financial industry for the circular economy and proposed the policy recommendations to build a financial supporting system which is market-oriented and takes the finance as its main body for the circular economy. Shi-gai Chai (2013) analyzed the technical and influence foundation of industry finance. This paper built the influence coefficient and sensitivity coefficient to analyze the interaction effects of industry finance and other sectors respectively and found that the financial industry developed quietly independently. Jie Bai (2014) used the input-output table in 2007 in Jiangsu province to analyze the direct influence and complete influence of the financial industry on Jiangsu's economy and found that the financial industry was the important part of Jiangsu's economic system, but its promoting role to the economy was weak.

Based on the previous research, this paper studies the input-output relevancy between the financial industry and the three major industries in China by establishing the simple form of the input-output table and computing the correlation coefficient matrix.

2. Introduction to the Industry Relevance Theory

Industry relevance theory is the theory studying the technical and economic links and industrial input-output quantitative relevancy between the industries. Industry relevancy refers to the technical and economic links based on the various input-output factors between the industries. Each industrial sector contributes products and services between each other, relates and constrains with each other, constituting the organic whole of the national economy.

There is a wide range of technical and economic relevancy between the industries and the relevancy approach is various. This paper mainly studies the direct and indirect relevancy between the industries. In addition, according to the technical directions and characteristics between the industries, it can be divided into one-way relevancy and multi-way relevancy; according to the supply and demand relationship between the industries, it can be divided into forward relevancy, backward relevancy and circular relevancy.

The direct relevancy and indirect relevancy between the industries are distinguished with each other based on the dependence of each industry. The so-called direct relevancy between the industries refers to the technical and economic relevancy based on the direct input of the factors of production for each other. The so-called indirect relevancy between the industries refers to the technical and economic relevancy between the two industries based on the other industries as intermediaries. The sum of the direct and indirect relevancy is known as the complete relevancy between the industries.

3. Data Sources and Processing

In this paper, the data was derived from China's input-output tables in 2007 and 2010. In order to study the relationships between the financial industry and the three major industries, this paper integrates the two tables in accordance with the principal of "pure departments", by integrating the input-output table into the form consisting of the primary industry, the secondary industry and the tertiary industry, with the financial industry separated from the tertiary industry (excluding financial industry from the tertiary industry), to form the two tables shown in Table 1 and Table 2.

Table 1. China's I-O table in 2007 (Unit: Million Yuan)

Input	Output	Intermediate Use: Primary Industry	Intermediate Use: Secondary Industry	Intermediate Use: Tertiary Industry	Intermediate Use: Financial Industry	Intermediate Use: Total Intermediate Use	Final Use	Total Outputs
Intermediate Inputs	Primary Industry	68771565	249167666	25500448	0	343439679	145490320	488930000
	Secondary Industry	102596499	3647832322	469599904	12534841	4232563565	1543244915	5775808480
	Tertiary Industry	26906576	457530730	286691544	35456998	806585848	922455052	1729040899
	Financial Industry	4063622	76324961	52668267	12505567	145562416	49247824	194810240
	Total Intermediate Inputs	202338262	4430855679	834460162	60497405	5528151509	2660438111	8188589620
Value-added	Labor Reward	271816270	459941924	333827065	34887741	1100473000		
	Net Product Tax	478020	270102903	99445624	15160686	385187233		
	Depreciation of Fixed Assets	14297448	181617238	174702367	1938269	372555322		
	Operating Surplus	0	433290736	286605680	82326139	802222556		
	Total Value-added	286591738	1344952802	894580737	134312835	2660438111		
Total Inputs		488930000	5775808480	1729040899	194810240	8188589620		

Table 2. China's I-O table in 2010 (Unit: Million Yuan)

Input	Output	Intermediate Use: Primary Industry	Intermediate Use: Secondary Industry	Intermediate Use: Tertiary Industry	Intermediate Use: Financial Industry	Intermediate Use: Total Intermediate Use	Final Use	Total Outputs
Intermediate Inputs	Primary Industry	92202500	404595539	42331039	0	539129077	154068923	693198000
	Secondary Industry	150873610	5505067558	700015902	20224053	6376181123	2394105244	8770286368
	Tertiary Industry	39271469	786175862	432144502	66923525	1324515358	1415583170	2740098528
	Financial Industry	5514421	130341896	88365179	25911914	250133409	72732416	322865826
	Total Intermediate Inputs	287862000	6826180854	1262856622	113059492	8489958968	4036489753	12526448721
Value-added	Labor Reward	385628326	766230298	691620833	66609819	1910089276		
	Net Product Tax	783500	395917965	176855395	25551609	599108470		
	Depreciation of Fixed Assets	18924174	255441444	273633874	4919117	552918609		
	Operating Surplus	0	526515806	335131804	112725789	974373399		
	Total Value-added	405336000	1944105514	1477241906	209806334	4036489753		
Total Inputs		693198000	8770286368	2740098528	322865826	12526448721		

4. Analysis on the Linkage Effect between the Financial Industry and the Three Major Industries

4.1 Analysis on the Direct Dependency between the Financial Industry and the Three Major Industries

The development of the financial industry needs to consume the products from the other industries directly; meanwhile the financial industry provides services for the development of the other industries. To grasp the role and the position of the financial industry in the economic system accurately, we need to analyze the direct effect of the financial industry on the national economy firstly. The direct consumption coefficient, intermediate input coefficient, initial input coefficient, direct labor reward coefficient, direct product tax coefficient, direct depreciation of fixed assets coefficient and the direct operating surplus coefficient are used to analyze the direct dependency between the financial industry and the three major industries in this paper. The calculation formula of each coefficient is as follows:

1). Direct Consumption Coefficient:

$$a_{ij} = \frac{x_{ij}}{X_j}(i, j = 1,2, \dots n) \tag{1}$$

2). Intermediate Input Coefficient:

$$Ac_j = \frac{\sum_{i=1}^{n} x_{ij}}{X_j}(j = 1,2, \dots n) \tag{2}$$

3). Initial Input Coefficient:

$$Ag_j = \frac{V_j+T_j+D_j+M_j}{X_j}(j = 1,2, \dots n) \tag{3}$$

4). Direct Labor Reward Coefficient:

$$Av_j = \frac{V_j}{X_j}(j = 1,2, \dots n) \tag{4}$$

5). Direct Product Tax Coefficient:

$$At_j = \frac{T_j}{X_j}(j = 1,2, \dots n) \tag{5}$$

6). Direct Depreciation of Fixed Assets Coefficient:

$$Ad_j = \frac{D_j}{X_j}(j = 1,2, \dots n) \tag{6}$$

7). Direct Operating Surplus Coefficient:

$$Am_j = \frac{M_j}{X_j}(j = 1,2, \dots n) \tag{7}$$

Using the data from the Table 1 and 2, and according to the above formulas, each input coefficient will be calculated and listed in Table 3 and 4.

Table 3. Direct dependency table in 2007

		Primary Industry	Secondary Industry	Tertiary Industry	Financial Industry
Direct Consumption Coefficient	Primary Industry	0.1407	0.0431	0.0147	0.0000
	Secondary Industry	0.2098	0.6316	0.2716	0.0643
	Tertiary Industry	0.0550	0.0792	0.1658	0.1820
	Financial Industry	0.0083	0.0132	0.0305	0.0642
Intermediate Input Coefficient		0.4138	0.7671	0.4826	0.3105
Initial Input Coefficient		0.5862	0.2329	0.5174	0.6895
Direct Labor Reward Coefficient		0.5559	0.0796	0.1931	0.1791
Direct Product Tax Coefficient		0.0010	0.0468	0.0575	0.0778
Direct Depreciation of Fixed Assets Coefficient		0.0292	0.0314	0.1010	0.0099
Direct Operating Surplus Coefficient		0.0000	0.0750	0.1658	0.4226

Table 4. Direct dependency table in 2010

		Primary Industry	Secondary Industry	Tertiary Industry	Financial Industry
Direct Consumption Coefficient	Primary Industry	0.1330	0.0461	0.0154	0.0000
	Secondary Industry	0.2176	0.6277	0.2555	0.0626
	Tertiary Industry	0.0567	0.0896	0.1577	0.2073
	Financial Industry	0.0080	0.0149	0.0322	0.0803
Intermediate Input Coefficient		0.4153	0.7783	0.4609	0.3502
Initial Input Coefficient		0.5847	0.2217	0.5391	0.6498
Direct Labor Reward Coefficient		0.5563	0.0874	0.2524	0.2063
Direct Product Tax Coefficient		0.0011	0.0451	0.0645	0.0791
Direct Depreciation of Fixed Assets Coefficient		0.0273	0.0291	0.0999	0.0152
Direct Operating Surplus Coefficient		0.0000	0.0600	0.1223	0.3491

Through the horizontal analysis of the direct consumption coefficient matrix in the above table, this paper investigates the promoting role of the financial industry to the other industries. In 2007, the largest direct effect of the financial industry to other industries is itself, the coefficient is 0.0642. It means that every one unit product of the financial industry needs 0.0642 units of its own inputs. Except the financial industry itself, the rest is the tertiary industry (0.0305), the secondary industry (0.0132) and the primary industry (0.0083). It shows that the financial industry has a largest impact on the tertiary industry and a weakest impact on the primary industry. This result conforms to the policy that develops the tertiary industry vigorously in China. In 2010, the financial industry still makes the largest effect on itself, and follows the tertiary industry, the secondary industry and the primary industry. The direct effect of the financial industry only declined slightly to the primary industry, the other two industries both raise. It shows that the financial industry plays an increasingly important role in the economic system.

Through the longitudinal analysis of the direct consumption coefficient matrix in the above table, this paper investigates the promoting role of the other industries to the financial industry. The financial industry consumes 0.1802 units of the products from the tertiary industry, 0.0643 units of the products from the secondary industry, 0.0642 units of the products from the financial industry and 0 units of the products from the primary industry for every unit output in 2007. It shows that the development of the financial industry doesn't need the direct consumption of the products from the primary industry. In other words, the financial industry doesn't have a direct pulling impact on the primary industry. The financial industry consumes 0.2073 units of the products from the tertiary industry, 0.0803 units of the products from the financial industry, 0.0626 units of the products from the secondary industry and 0 units of the products from the primary industry for every unit output in 2010. It shows that the financial industry makes an increasing pulling impact on itself and the tertiary industry, and the pulling impact decreases on the secondary industry. It can be seen that the development of the financial industry mainly needs the direct input from the tertiary industry, so improving the development of China's financial industry and developing the tertiary industry are two indivisible aspects.

The intermediate input coefficient of the financial industry is 0.3105 and the initial input coefficient is 0.6895 in 2007; the intermediate input coefficient is 0.3502 of the financial industry and the initial input coefficient is 0.6498 in 2010. It can be found that the intermediate input coefficient of China's financial industry is on the rise and the initial input coefficient is on the decline, and the intermediate input coefficient is far lower than the initial input coefficient, fully proved that the financial industry is a high value-added industry.

In the added-value coefficients, the direct operating surplus coefficient is the highest and is far higher than the other industries at the same period both in 2007 and 2010. It means that the financial industry is an industry of great economic benefit. The direct labor reward coefficient of the financial industry is also higher than the other industries. It means that the financial industry has a great need of the talent. So it is necessary to develop the new financial talent to promote the further development of the financial industry. The direct product tax coefficient is also higher than the other industries at the same period. It means that the development of the financial industry can make the national treasury solid so as to facilitate people's production and living.

4.2 Analysis on the Complete Dependency between the Financial Industry and the Three Major Industries

There are not only direct links between each industry of the national economy, but also a lot of indirect links. For example, the direct consumption coefficient between China's financial industry and the primary industry is 0, but it doesn't mean that the development of the financial industry doesn't need to consume the products from the primary industry. As we can see, the production of the financial industry needs paper, and the production of paper needs the input of the primary industry, so as to make an indirect link between the financial industry and the primary industry. In this paper, the complete consumption coefficient is used to analyze the complete dependency between the financial industry and the three major industries. The calculation formula and the matrix form of the complete consumption coefficient are as follows:

$$b_{ij} = a_{ij} + \sum_{k=1}^{n} b_{ik} a_{kj} (i, j = 1,2, \dots n) \tag{8}$$

$$B = (I - A)^{-1} - I \tag{9}$$

Using the above formula, the complete consumption coefficients are listed in the Table 5 and 6.

Table 5. Complete consumption coefficient in 2007

Industry	Primary Industry	Secondary Industry	Tertiary Industry	Financial Industry
Primary Industry	0.207257	0.1581196	0.0737454	0.0252149
Secondary Industry	0.8123965	2.043298	1.0200851	0.4076495
Tertiary Industry	0.1627867	0.3113176	0.3131112	0.2767965
Financial Industry	0.0274928	0.0545125	0.0578021	0.0835873

Table 6. Complete consumption coefficient in 2010

Industry	Primary Industry	Secondary Industry	Tertiary Industry	Financial Industry
Primary Industry	0.2006053	0.1676965	0.0739595	0.028089
Secondary Industry	0.8278312	2.0345016	0.95169	0.421144
Tertiary Industry	0.1762232	0.3496679	0.3087343	0.3187593
Financial Industry	0.0299397	0.0627441	0.0619057	0.1054837

Firstly, this paper investigates the complete dependence of the other industries to the financial industry by the horizontal analysis on the above table. In 2007, the financial industry itself consumes the largest amount of the complete financial inputs (0.0836), follows the tertiary industry (0.0578), the secondary industry (0.0545) and the primary industry (0.0275), it shows that the financial industry has a strongest complete promoting function to itself. In 2010, the financial industry itself also consumes the largest amount of the complete financial inputs (0.1055), follows the secondary industry (0.0627), the tertiary industry (0.0619) and the primary industry (0.0299). The complete consumption of each industry to the financial industry increases in all. It means that the financial industry has a stronger promoting function to each industry. And in 2010, the complete consumption of the financial products in the secondary industry is higher than the tertiary industry. It shows that the promoting function of the financial industry to the secondary industry has remarkable strengthened.

Through the longitudinal analysis of the table above, this paper investigates the complete dependence of the financial industry to the other industries. In 2007, the quantity of the products that the financial industry completely consumes is the secondary industry (0.4076), the tertiary industry (0.2768), the financial industry (0.0836) and the primary industry (0.0252) in turn. It is noticed that there is no direct link between the financial industry and the primary industry, so the 0.0252 here is the entire indirect link between them. And the complete consumption of the financial industry to itself is also low; it shows that the indirect internal link of the financial industry is low. It is due to the separate operation of the financial industry in our country. In 2010, the quantity of the products that the financial industry completely consumes is the secondary industry (0.4211), the tertiary industry (0.3188), the financial industry (0.1055) and the primary industry (0.0281). From the data in 2007 and 2010, it can be seen that the production of the financial industry needs to completely consume the products from the secondary industry most, and this is different from the direct link between the financial industry and the other industries.

4.3 Analysis on the Spread Effect between the Financial Industry and the Three Major Industries

Due to the complex associations between the industries, the change of one industry will have different degrees of spread effects on the other industries. In this paper, the influence coefficient is used to analyze the degree of the spread effect of the financial industry on the other industries, and the response coefficient is used to analyze the degree of the spread effect of the other industries on the financial industry.

4.3.1 Analysis on the Spread Effect of the Financial Industry on the Other Industries

The influence coefficient reflects the degree of the spread effect of the production of one industry to the other industries; it shows the degree of the influence of this industry on the other industries. The influence coefficient is the important basis to determine the dominant industry; it means that if the coefficient of this industry is greater than 1, the degree of the effect of this industry to the other industries is higher than the social average level; on the contrary, it means that the degree of the effect is less than the social average level. The greater the influence coefficient is, the greater the pulling function to the other industries is, and the backbone role in the national economy is stronger (Ying-fei Lv, 2012). The calculation formula of the influence coefficient is as follows:

$$The\ influence\ coefficient = \frac{the\ average\ value\ of\ the\ column\ coefficient\ of\ one\ industry\ in\ leotief\ inverse\ matrix}{the\ average\ value\ of\ the\ column\ coefficient\ of\ all\ industries\ in\ leotief\ inverse\ matrix} \quad (10)$$

The influence coefficient of the financial industry calculated by the formula above is listed in Table 7:

Table 7. Influence coefficient table

	2007	2010
Primary Industry	0.8809	0.8833
Secondary Industry	1.4219	1.4288
Tertiary Industry	0.9824	0.9472
Financial Industry	0.7148	0.7406

The influence coefficient of the financial industry is 0.7148 in 2007 and 0.7406 in 2010, both are less than 1; it shows that the influence of the financial industry to other industries is less than the social average level. And the pulling function of the financial industry to other industries is not obvious because the influence coefficient of the financial industry is less than the coefficient of other industries. However, the influence coefficient of the financial industry is on the rise; it shows that the pulling function of the financial industry to other industries increases year by year.

4.3.2 Analysis of the Spread Effect of the Other Industries on the Financial Industry

The response coefficient reflects the degree of the demand of one industry to the other industries. The greater the response coefficient is, showed that the demand response of this industry to the economy development is stronger, and the pulling function of the other industries to this industry is stronger. Generally speaking, the response coefficient is higher at the rapid economic growth period. The calculation formula of the response coefficient is as follows:

$$The\ response\ coefficient = \frac{the\ average\ value\ of\ the\ row\ coefficient\ of\ one\ industry\ in\ leotief\ inverse\ matrix}{the\ average\ value\ of\ the\ row\ coefficient\ of\ all\ industries\ in\ leotief\ inverse\ matrix} \quad (11)$$

The response coefficient of the financial industry calculated by the formula above is listed in Table 8:

Table 8. Response coefficient table

	2007	2010
Primary Industry	0.5837	0.5812
Secondary Industry	2.1060	2.0694
Tertiary Industry	0.8227	0.8512
Financial Industry	0.4876	0.4981

The response coefficient of the financial industry is 0.4876 in 2007 and 0.4981 in 2010, both are less than the coefficient of the other industries at the same period, it shows that the pulling function of the other industries to the financial industry is not obvious.

4.3.3 Brief Summary

It can be found from the analysis above that the influence coefficient and the response coefficient of the financial industry are both less than 1; it shows that the supply promoting function and the demand pulling function of the financial industry to the three major industries are both not obvious. It shows that the contribution of the financial industry to the national economy is small, and the development of the financial industry can't promote the development of the other industries fully. There is a long way to go before the financial industry becomes a pillar industry, but it also shows that the financial industry has a huge development space in the future.

4.4 Analysis on the Intermediate Input Rate and the Intermediate Demand Rate of the Financial Industry

The intermediate input rate and the intermediate demand rate are the indexes that reflects the industrial relevancy, generally be used to determine the position of the industry at the economic system.

4.4.1 Analysis on the Intermediate Input Rate of the Financial Industry

The intermediate input rate is the ratio of the intermediate inputs and the total inputs; it reflects the proportion of a certain industry that consumes the intermediate products from other industries (including the industry itself). The calculation formula of the rate is as follows:

$$F_j = \frac{\sum_{i=1}^{n} x_{ij}}{\sum_{i=1}^{n} x_{ij} + D_j + N_j} (j = 1,2, \dots n) \quad (12)$$

In this formula, D_j represents depreciation of fixed assets of the industry; N_j represents the value created by the industry, consisting of the labor reward, net product tax and the operating surplus. Due to the sum of the intermediate input rate and the value-added rate is 1, the higher the intermediate input rate of the industry is, the lower the value-added rate (sum of the depreciation and the net salvage) of the industry is. It is generally believed that the industry whose intermediate input rate is above 50%, it is the "low value-added and high driving capability" industry; on the contrary, is the "high value-added and low driving capability" industry (Ying-fei Lv, 2012). The intermediate input rate of the financial industry and the three major industries is calculated by the formula and listed in the Table 9:

Table 9. Intermediate input rate table

	2007	2010
Primary Industry	0.4138	0.4153
Secondary Industry	0.7671	0.7783
Tertiary Industry	0.4826	0.4609
Financial Industry	0.3105	0.3502

The intermediate input rate of the financial industry is 0.3105 in 2007, less than 50%, and less than the three major industries obviously; it shows that the financial industry is a high value-added industry, but the capability of promoting the other industries is low. Combined with the data of 2010, it is found that the intermediate input rate of the financial industry is on the rise.

4.4.2 Analysis on the Intermediate Demand Rate of the Financial Industry

The intermediate demand rate is the ratio of the intermediate demands and the total demands; it reflects the degree of the products from a certain industry demanded by the other industries (including the industry itself). The calculation formula is as follows:

$$G_j = \frac{\sum_{j=1}^{n} x_{ij}}{\sum_{j=1}^{n} x_{ij} + Y_i} (i = 1,2, \dots n) \tag{13}$$

In this formula, Y_i represents the final products of the industry, which is the amount of the products that used to be consumed. The higher the rate is, the more capital goods that the industry provides. Generally speaking, the industry whose intermediate demand rate is higher than 50% is the industry that mainly provides productive services and the industry whose intermediate demand rate is less than 50% is the industry that mainly provides life services (Ying-fei & Yan-li, 2012). The rate calculated by the formula above is listed is the Table 10:

Table 10. Intermediate demand rate table

	2007	2010
Primary Industry	0.7024	0.7777
Secondary Industry	0.7328	0.7270
Tertiary Industry	0.4665	0.4834
Financial Industry	0.7472	0.7747

The intermediate demand rate of the financial industry is 0.7472 in 2007, higher than 50%; it shows that the financial industry mainly provides productive services to meet the demand of the intermediate products of the other industries. It can be found that the intermediate demand rate of the tertiary industry besides the financial industry is 0.4665; it shows that the tertiary industry besides the financial industry mainly provides life services, and this is an important difference between the financial industry and the other tertiary industry. Combined with the data of 2010, it is found that the intermediate demand rate of the financial industry is on the rise.

4.4.3 Brief Summary

It can be found from the analysis above that the financial industry is a high value-added industry and mainly provides productive services. However, the promoting function of the financial industry to the other industries is low, so the financial industry may become a bottleneck industry restricting the development of the national economy. So China should develop the financial industry vigorously and pay attention to the inosculation of the financial industry and the other industries at the same time.

5. Conclusions and Suggestions

5.1 Conclusions

There are five conclusions in the analysis of the direct dependency:

1). The financial industry has a strongest direct influence on itself, and its direct promoting role to the three major industries is on the rise.

2). The development of the financial industry doesn’t need the direct consumption of the products from the primary industry, and mainly needs the direct inputs of the tertiary industry.

3). The financial industry is a high value-added industry.

4). The financial industry has a great economic benefit.

5). The financial industry has a great need of talents.

There are two conclusions in the analysis of the complete dependency:

1). The financial industry has a strongest complete promoting role to itself. And it has a stronger and stronger complete promoting role to the secondary industry.

2). The financial industry has a low complete consumption on itself; it shows that the internal indirect relevancy in the financial industry is low because of the separate operation in China. The financial industry completely consumed the products from the secondary industry mostly.

There are three conclusions in the analysis of the spread effect:

1). Based on the analysis on the influence coefficient, it is found that the pulling role of the financial industry to the other industries is not obvious, but the coefficient is on the rise, it shows that the pulling role to the other industries is on the rise.

2). Based on the analysis on the response coefficient, it is found that the pulling role of the other industries to the financial industry is not obvious.

3). Both of the influence coefficient and the response coefficient are less than 1, it indicates that the supply promoting role and the demand pulling role of the financial industry to the three major industries are not obvious.

In the analysis of the intermediate input rate and intermediate demand rate, it is found that the financial industry is a high value-added industry and an industry that mainly provides the productive services. However, the promoting role of the financial industry to the other industries is low, so the financial industry may become a bottleneck industry restricting the development of the national economy.

In conclusion, although the financial industry has a rapid development in China, its position and role in the national economy is still not outstanding. There is still a long way to go before the financial industry becomes a pillar industry.

5.2 Suggestions

There are several suggestions proposed according to the above conclusions in this paper:

1). To play the pulling role of the financial industry to the national economy effectively, China should improve the industrial structure of the financial industry to promote its development.

2). Due to the development of the financial industry has a great need of the direct input of the tertiary industry and the complete input of the secondary industry, China should put the development of the tertiary industry and the improvement of the secondary industry as a top task in order to improve the development of the financial industry.

3). China should speed up the cultivation of the financial talent in order to develop the financial industry due to the development of the financial industry has a great need of talents.

4). The financial industry has a great economic benefit, but it is easy to become a bottleneck industry restricting the development of the national economy. So China must put the development of the financial industry as an important task in the period of the economic transition so as to play the promoting role of the financial industry to the real economy effectively.

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Performance Assessment of Real Estate Investment Trusts (REIT) Listed in BIST Via Different Multi Criteria Decision Making Methods

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Abstract

Firms' performance assessment which gained crucial importance in last decades is essential issue for decision makers in financial sector. They can acquire competitive power by this way. In this study financial performance of twelve real estate investment trusts (REITs) listed in BIST is analyzed by using four financial indicators within the period of 2011-2015. Therefore firstly weights of criteria related to financial ratios are obtained by using Chang's Extent Analysis Method on Fuzzy Analytic Hierarchy Process (FAHP). Following to this firms' final rankings are determined by means of TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) and VIKOR (Vise Kriterijumska Optimizacija I Kompromisno Resenje) methods respectively. Also ranking performance of these two methods is interpreted.

Keywords: performance analysis, multi criteria decision making, analytic hierarchy process, TOPSIS, VIKOR, real estate investment trust, BIST

1. Introduction

Real Estate Investment Trusts (REITs) are established with aim for investing high return potential real estates and real estate based projects also making profit from real estate leasing and commerce. Portfolio earnings of REITs are distributed to shareholders as dividends within the frame of capital markets board regulations in the year-end (https://www.sec.gov).

REITs are only operated within the concept of real estate based portfolio management and hence machine and equipment are not contained in their assets. Furthermore they do not undertake the responsibility of civil works and conduct a project but finance civil projects under the responsibility of other companies.

Real estates and real estate based investments develop psychological trust for investors. Earnings of REITs are exempt from corporation tax. While nine REITs are listed in IMKB in 2009, thirty two REITs are listed in BIST nowadays (http://www.spk.gov.tr).

Studies about real estate investment trusts (REITs) are introduced in USA since 1970s. First studies are aimed to evaluate the performance of REITs. There are no more studies about REITs, developed in 1990s and 2005, in other countries. Studies in Turkey which is introduced from 2000s depend on process and legal infrastructure of REITs. According to the literature this study is one of the rare ones based on analyzing the performance of REITs traded in Turkey via multi criteria decision making methods.

2. Financial Performance Indicators

While financial indicators are used for specifying the firms' value by investors and shareholders; they are utilized by creditors for determining solvency capacity and financing costs. Valuation models determining firms' market value can be classified into accounting and financial models. According to the accounting ones firm value is considered as a function of a number of variables such as profit margin, earnings per share, profitability growth ratio, cash flows, book value and dividends.

With respect to financial models firm value is handled as a function of yield capacity from available assets and potential investments, return level and cost of capital. It is pointed out the superiority of economic value added (EVA) over other indicators in revealing the firms' real value. Financial indicator namely EVA was used for detecting financial performance and purpose of firms, projects planned to invest and intellectual capital (Baybordi, Barvari, Bahramihajlabad, & Sheykhlov, 2013, p.1307).

A number of studies measuring firms' financial performance are based on comparing the effect of value based performance indicators and traditional ones. Lehn and Makhija (1997) found out the outstanding performance of EVA over traditional based indicators. As opposed to that Biddle, Bowen and Wallace (1997) revealed the superiority of accounting based indicators. Chen and Dodd (1998) analyzed the efficiency of operating profit, residual income and EVA in firm valuation and did not find the EVA as the most effective one. Acheampong and Wetzstein (2001) stressed the indifference between value based indicators and traditional ones and asserted the joint consideration. Worthington and West (2004) concluded that the effectiveness of EVA usage in determining stock yield than traditional performance indicators such as net cash flows and residual income.

Superiority of performance indicators change according to the application field. Therefore REITs, inadequate interest shown by researchers, are considered in this study. Both traditional performance indicators (return on assets, residual income and return on sales) and value based ones (EVA) are used for measuring the performance of REITs. In addition to this firms are compared with regard to multi criteria decision making (MCDM) methods.

2.1 Return on Assets

Return on assets degrades profit/cost and investments into a ratio by dealing the concept of profitability. Furthermore it is one of the commonly used performance ratios for comparing the return of assets in terms of firms' investments which are made or planned.

The ratio of return of assets (ROA) shows how firms efficiently used their total assets and calculated by various ways:

$$\textit{Return of Assets} = \textit{Profit/Total Assets} \tag{1}$$

$$\textit{Return of Assets} = \textit{Return on Sales x Investment Turnover} \tag{2}$$

According to the different viewpoints profit, shown in Eq. (1), can be treated as operating profit or net profit. Similarly total assets, depicted in Eq. (1), can be considered as firms' assets held or computed as total assets – short term debts according to different applications (Yükçü & Atağan, 2009, p. 9).

2.2 Residual Income

Investors desire firms being appreciate and want to see the result of their investments. Ratios namely net return on investments (ROI) and residual income are used for this purpose. In addition to the similarity between ratios; while ROI is depicted as percentage residual income is shown as amount. This is the reason for preferring residual income by managers.

Although item namely cost of financial sources are available in the income statement, it is not true for owner's equity. Therefore added value is calculated as subtracting cost of equity from net income in case of determining cost for owner's equity. According to the Öztürk (2010), who made a study aimed at examining the manufacturing firms listed in BIST, firms should focus on residual income that will create value for shareholders and increasing their market value.

According to the method of residual income expected return on capital is generally assumed as constant and equity expenditures in the ith year are calculated as multiplying return on equity by the book value of equity at the beginning of year (Yavuzarslan, 2007, pp. 11-17).

$$\textit{Equity Expenditures} = \textit{Book value of equity x expected return on capital} \tag{3}$$

$$\textit{Residual income} = \textit{Net income} - \textit{Capital expenditures} \tag{4}$$

Different approaches and formulations are used for defining the residual income. According to Yükçü (2007) residual income is formulated as:

$$\textit{Residual income} = \textit{Operating profit} - (\textit{Expected income x Total assets}) \tag{5}$$

If residual income is positive added value is created otherwise it is lost.

2.3 Economic Value Added (EVA)

The ratio of economic value added (EVA) is introduced in the early period of 1980s. EVA, which ignores the cost of capital, is mostly used method to avoid the misleading effect of accounting based traditional performance indicators. A number of big businesses like Coca-Cola, IBM, Whirlpool use this method in planning and performance auditing.

EVA aims to calculate the value that is created via firms' sources in a period. Variables which is unavailable in accounting records are used for this purpose and so developments in the sector can be measured. EVA, in which economic value is used as basic one, provides analyzing the effects of growth in terms of whole business and its' parts. EVA , which considers the cost of equity and resource, is an indicator of earnings exceeding the cost of capital and differs from the performance indicators like earnings per share, ROA and return on equity. EVA can be formulated as below:

$$EVA = \textit{Net Operating Profit Less Adjusted Taxes} - (\textit{Invested Capital} \times \textit{Weighted Average Cost of Capital}) \quad (6)$$

$$EVA = (\textit{Return on Invested Capital} - \textit{Weighted Average Cost of Capital}) \times \textit{Invested Capital} \quad (7)$$

According to Eq. (6) firm creates added value if the value of EVA being positive in other words the value of net operating profit less adjusted taxes exceeds the capital expenditures. Value of EVA can be increased by decreasing the capital expenditures or raising the net operating profit less adjusted taxes (Yavuzarslan, 2007, p. 39)

There are some difficulties in calculating the value of EVA such as the weighted average cost of capital. Weighted average cost of capital can be computed as below:

$$\textit{Weighted Average Cost of Capital} = (\textit{Debt Ratio} \times \textit{Cost of Debt After Taxes}) + (\textit{Ratio of Owner's Equity} \times \textit{Cost of Equity}) \quad (8)$$

2.4 Return on Sales

Return on sales which is one of the commonly used performance indicator is easily computed and formulated as below:

$$\textit{Return on Sales} = \textit{Operating Profit/Sales} \quad (9)$$

3. Literature Review

Smith and Shulman (1976) compared the performances of REITs operated in USA with S&P index, savings accounts and 15 investment funds in the period of 1963-1974. With this aim capital assets pricing model (CAPM) is used. As a result sample consisted of REITs outperform than other indicators within the period of 1963-1974.

Han and Liang (1985) evaluated the return performance of REITs within the period of 1970-1993. According to the Jensen model results, REITs similarly perform with market portfolio and treasury bills. Titman and Warga (1986) examined the performance of REIT shares within the period of 1973-1982 via CAPM and arbitrage pricing model (APM). According to their results REITs based portfolio similarly perform with market portfolio.

Kuhle and Walther (1987) compared the net income values of 102 REITs in the period of 1973-1984. Goebel and Kim (1989) examined the return performance of portfolio consisted of finite life real estate investment trusts (FREITs) in the period of 1983-1987. With this aim Jensen's performance measure is used.

Mcintosh et al. (1991) investigated the relationships between size of enterprise and return of REITs for the period of 1974-1988 and found significant negative relation. Peterson and Hsieh (1997) studied the effect of market value/book value and size of enterprise on the return of REITs and found significant positive relation between return of REITs and size of enterprise and market value/book value respectively.

Chen, Hsieh, Vines, and Chiou (1998) analyzed the return performances of capital based REITs listed in NYSE, AMEX and NASDAQ stock exchanges within the period of 1978-1994. Buttimer, Hyland and Sanders (2001) analyzed the long term performance of REITs by using FAMA and French's three factor model in the period of 1990-1999.

Bley and Olson (2005) examined the performances of equity based REITs, mortgaged REITs and S&P 500 indexes in the range of 1973-2001. Equity based REIT index has high correlation and return on risks than mortgaged REIT index.

Glascock, Lu, and So (2006) made a study in terms of real estate markets in Asia like Taiwan, Japan, Hong Kong, South Korea, Thailand and Singapore within the period of 1980-1990. With this purpose income behavior of public companies, invest in real estate, are analyzed via regression models and supernormal rate of return is found in Taiwan real estate market apart from other markets.

Bond and Glascock (2006) examined the performance and portfolio diversification characteristics of publicly traded REITs within the period of 1990-2005. According to the results REITs contribute to portfolios as risk mitigant and income promoter. Additionally it is determined that REITs outperform than other shares in recession period.

Derwall, Huij, Brounen, and Marquering (2009) aimed to analyze the explanatory power of momentum factor in defining the return of REITs. With this aim monthly returns of REITs traded in the period of 1980-2006 are handled. As a result momentum factor is considered as an essential explanatory in making valuation the portfolio performance.

Yong et al. (2009) assessed the sensitivity of return of REITs, traded in Australia, on the firm related variables. Data is acquired via panel regression analysis in the period of 1990-2008. It is found significant negative relation between size of enterprise and return of REITs, conversely significant positive relation between return of REITs and market value/book value and degree of leverage are obtained respectively.

Chang and Chang (2010) researched the effects of firm size, market value/book value and degree of leverage on return of REITs by using Fama and French three factor model. According to the study results there is significant negative relation between firm size and return of REITs. On the other hand, there is no significant relation between degree of leverage and return of REITs.

Studies aimed to reveal relationship between size of enterprise and return of REITs are made by Chen et al. (1998), Marts and Elayan (1990) and similar results are gained. Accordingly relationship between market value/book value and return of REITs are found out by Bers and Springer (1997), Goebel et al. (2013) and Niskanen et al. (2011). Similar results are valid for this relationship (Şahin, 2014; pp. 11-12).

Studies made in Turkey are not enough as well as can be summarized as below:

Akçay (2000) evaluated the specifications and applications of REITs in Turkey. Performances of REITs are examined from 1997, first public offering time, to June 1999 and compared with return performances of other investment tools. As a result performances of REITs are changed by years.

Yetkin (2004) handled the applicability of balanced score card (BSC) on REITs traded in Turkey and concluded that traditional measuring and management models lose validity. For this reason REITs can use BSC model in order to provide successful and efficient performance management.

Güven (2006) found the factors affecting the stock yield of REITs by means of multivariable regression model. For this purpose return index of REITs are considered as outcome variable, on the other hand BIST 30 index, government debt securities, exchange rate and consumer price indices are treated as independent variables. As a result return ratio of BIST 30 index and exchange increase rate are found as the most significant variables affecting return index of REITs.

Özdemir and Türker (2007) studied the effects of inflation and interest ratios on REITS traded in Turkey. According to the study results REITs perform similarly or better than the return of market portfolio in the years 2002-2006.

4. Methodology

4.1 Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP), developed by T. L. Saaty (1980), is a decision making mechanism composed of overall goal, criteria and sub criteria (if there are any), and alternatives. AHP considers rational and intuitive domains to select the best alternative evaluated with respect to several criteria and sub criteria (Bhushan & Rai, 2004, p. 15). AHP considers subjective and objective opinions of decision makers in decision process and provide them to aggregate tangible quantitative and intangible qualitative factors (Saaty, 1990, p. 20).

AHP decomposes complex decision problem into a tree hierarchy composing of objectives, criteria, sub criteria (if needed) and alternatives. The aim of AHP is to weight criteria and indicators by pairwise comparisons. Importance of elements in a given level is judged with regard to some or all of the elements in adjacent level via pairwise comparisons (Zhou, Maumbe, Deng, & Selin, 2015, p. 72). By using AHP we can decouple problem into sub problems by evaluating subjectively manner that is transformed into numerical values and ranked on a numerical scale (Bhushan & Rai, 2004, p. 15).

Phases of AHP can be summarized as follows (Bhushan & Rai, 2004, p. 15):

a) Problem is defined and decomposed into hierarchy of goal, criteria, sub criteria and alternatives which shows relationship between components at each level. At each level of comparison decision maker consider contribution of lower level components to upper level one.

b) Data is collected from experts or decision makers that can be analyzed as pairwise comparison on fundamental scale representing intensities of judgments. Fundamental scale for multiple pairwise comparisons developed by Saaty and Vargas (2012) and showed in Table 1.

Table 1. Fundamental scale

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one activity over another
5	Strong importance	Experience and judgment strongly favor one activity over another
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values	

c) Pairwise comparison matrix is constructed and organized into square matrix. These matrices are positive and reciprocal ($a_{ij} = 1/a_{ji}$). If the value of component (i,j) is greater than 1, criterion in the ith row is better than the jth one. Each element in upper level is used to compare with lower level ones with regard to it (Saaty, 2008).

d) Local and global weights of each criteria and sub criteria are calculated, and the principle right eigenvector (ω) and largest eigenvalue (λ_{max}) are obtained. By using discrete paired comparisons ratio scales are derived in form of normalized right eigenvectors. Components of normalized eigenvector are determined as weights and ratings with regard to criteria/ sub criteria and alternatives.

e) Consistency of matrix is evaluated by means of consistency ratio (CR). Quality of AHP depends on consistency of pairwise comparisons. If all comparisons are perfectly consistent $a_{ij} = a_{ik}.a_{kj}$ relation is true for any combination of comparisons (Saaty, 1980). If ratio is lower than the threshold value comparisons must be re-evaluated. Consistency ratio, used for determining whether evaluations are sufficiently consistent, is derived by comparing the consistency index (CI) with the appropriate one of the following set of numbers each of which is average random consistency index (RI), developed by Saaty and Vargas (2012) and showed in Table 2, obtained by sample of randomly generated reciprocal matrices. Consistency index of a matrix of comparisons is CI= (λ_{max}- n)/ (n-1) where λ_{max} is the maximum eigenvalue of paired comparison judgement matrix. Saaty suggest that the CR value must be lower than 0,1.

Table 2. Average random consistency index (RI)

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.4	1.45	1.49

Source: T. Saaty & L.G. Vargas, "Models, Methods, Concepts & Applications of the Analytic Hierarchy Process (AHP)" (p.9), 2012, Boston: Springer.

f) In order to obtain local weights of each criteria, rating of each alternative is multiplied by weights of sub-criteria and then aggregated. Multiplying these local weights by criteria weights global ratings of alternatives are acquired.

AHP has been applied in a number of fields such as quality based investment (Güngör & Arıkan, 2007), machine and equipment selection (Ching & Been, 1996), purchasing decision process (Byun, 2001), strategic management (Yüksek & Akın, 2006), site selection decision (Chuang, 2001), performance measuring (Frei & Harker, 1999), resource allocation (Alphonce, 1997), sustainable city logistics planning (Awasthi & Chauhan, 2012), project selection (Amiri, 2010), maintenance strategy selection (Bevilacqua & Braglia, 2000), supplier selection planning model (Hwang, Moon, Chuang, & Goan, 2005), human performance improvement (Albayrak & Erensal, 2004), treatment selection (Richman et al., 2006).

4.2 Chang's Extent Analysis

Chang (1996) proposed an approach for dealing FAHP by using triangular fuzzy numbers for pairwise comparison and considering extent analysis for synthetic extent values of comparisons. Let $X = \{x_1, x_2, \ldots, x_n\}$ be an object set and $U = \{u_1, u_2, \ldots, u_n\}$ be a goal set. According to Chang's (1996) extent analysis each objective is taken and extent analysis for each goal is performed respectively. So m extent analysis values for each object can be obtained with the following signs:

$$M_{g_i}^1, M_{g_i}^2, \ldots, M_{g_i}^m, \quad i = 1,2,\ldots,n \tag{10}$$

Where all the $M_{g_i}^j (j = 1,2,\ldots,m)$ are triangular fuzzy numbers. Steps of Chang's extent analysis (1996) can be given as follows:

1-The value of fuzzy synthetic extent with respect to the ith object is defined as:

$$S_i = \sum_{j=1}^{m} M_{g_i}^j \otimes \left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^j \right]^{-1} \tag{11}$$

To obtain $\sum_{j=1}^{m} M_{g_i}^j$ the fuzzy addition operation of m extent analysis values for a particular matrix is performed such as

$$\sum_{j=1}^{m} M_{g_i}^j = \left(\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_j\right) \tag{12}$$

and to obtain $\left[\sum_{j=1}^{n} \sum_{j=1}^{m} M_{g_i}^j \right]^{-1}$ the fuzzy addition operation of $M_{g_i}^j (j = 1,2,\ldots,m)$ values is performed such as:

$$\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^j = \left(\sum_{i=1}^{n} l_i, \sum_{i=1}^{n} m_i, \sum_{i=1}^{n} u_i\right) \tag{13}$$

and then the inverse of the vector above is computed such as

$$\left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^j \right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i} \right) \tag{14}$$

2-The degree of possibility of $M_2 = (l_2, m_2, u_2); M_1 = (l_1, m_1, u_1)$ is defined as:

$$V(M_2 \geq M_1) = \sup_{y \geq x} \left[\min(\mu_{M_1}(x), \mu_{M_2}(y)) \right] \tag{15}$$

and can be expressed as follows:

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_2}(d) \tag{16}$$

$$= \begin{cases} 1, & if\ m_2 \geq m_1 \\ 0, & if\ l_1 \geq u_2 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & otherwise \end{cases} \tag{17}$$

Eq. (16) where d is the ordinate of the highest intersection point D between μ_{M_1} and μ_{M_2} is illustrated in

Figure 1 (Chang, 1996). To compare M_1 and M_2, we need both the values of $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$.

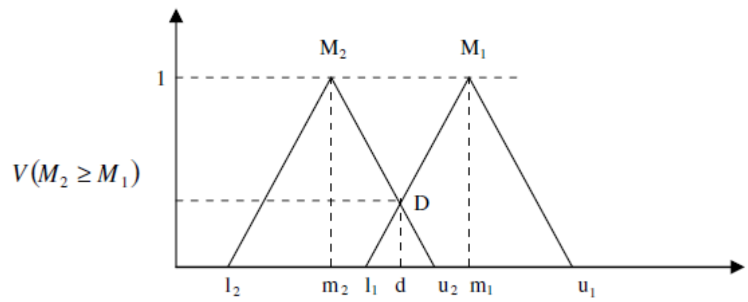

Figure 1. The definition of the degree of possibility of $V(M_2 \geq M_1)$

Source: Chang, D. Y. (1996). Applications of the extent analysis method on fuzzy AHP. *European Journal of Operational Research, 95*, 651.

3-The degree possibility for a convex fuzzy number to be greater than k convex fuzzy $M_i(i=1,2,\ldots,k)$ numbers can be defined by

$$V(M \geq M_1, M_2, \ldots, M_k) = V\lfloor(M \geq M_1) \; and \; (M \geq M_2) \; and \; \ldots and \; (M \geq M_k)\rfloor$$
$$= \min V(M \geq M_i), i=1,2,\ldots,k \tag{18}$$

Assume that $d(A_i) = \min V(S_i \geq S_k)$ for k=1,2,…,n; $k \neq i$ .Then the weight vector is given by

$$W' = (d'(A_1), d'(A_2), \ldots, d'(A_n))^T \tag{19}$$

where $A_i(i=1,2,\ldots,n)$ are n elements.

4-Via normalization, the normalized weight vectors are:

$$W = (d(A_1), d(A_2), \ldots, d(A_n))^T \tag{20}$$

where W is a non-fuzzy number.

While computational easiness and compliance with stages of traditional AHP (additional process are not required) can be considered as advantages of this method, allowing only triangular fuzzy numbers, assigning zero weights to some relative importance values and neglecting important information, causing faulty decisions comprise disadvantage side (Wang, Luo, & Hua, 2008, p. 745).

In order to overcome assigning zero weights to some criteria firstly Saaty's 9 point scale is carried out by decision maker's to construct pair-wise comparison matrix. Then adopting Eq. (21) proposed by Chen, Lin and Huang (2006) decision makers' pairwise comparison values are transformed into triangular fuzzy numbers and comprehensive pairwise comparison matrix is acquired. Let the fuzzy rating and importance weight of the *k*th decision maker be $\tilde{x}_{ijk} = (a_{ijk}, b_{ijk}, c_{ijk})$; i=1,2,…,m and j=1,2,…,n respectively. So the aggregated fuzzy ratings $(\tilde{x}_{ij})$ of alternatives with respect to each criterion can be calculated as below:

$$(\tilde{x}_{ij}) = (a_{ij}, b_{ij}, c_{ij})$$

where

$$l_{ij} = \min_k \{a_{ijk}\}, \qquad m_{ij} = \frac{1}{K}\sum_{k=1}^{K} b_{ijk}, \qquad u_{ij} = \max_k \{c_{ijk}\} \tag{21}$$

4.3 Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

Hwang and Yoon (1981) assert Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) for analyzing multi criteria decision making (MCDM) problems. Basis of this technique is to choose alternative having the shortest euclidean distance from positive ideal solution (PIS) which maximizes benefit and minimizes cost, and the farthest distance from negative ideal solution (NIS) which maximizes cost and minimizes benefit (Behzadian et al., 2012). TOPSIS has been applied in a number of fields such as supplier selection (Shahanaghi & Yazdian, 2009), facility layout selection (Chu, 2002), performance measurement and evaluation (Yurdakul & İç,2003), machine tool selection (Yurdakul & İç, 2009), outsourcing (Bottani & Rizzi, 2006).

Assumption of this technique is to maximize or minimize each criterion and pairwise comparisons are abstained. Structure of TOPSIS are revealed as follows (Tsaur, 2011):

1- Forming decision matrix $\left(X = (x_{ij})_{nxm}\right)$ for ranking the alternatives.

$$X = \begin{bmatrix} x_{11} & x_{12} \ldots & x_{1j} \ldots & x_{1m} \\ x_{21} & x_{22} \ldots & x_{2j} \ldots & x_{2m} \\ \vdots & \vdots \ \ldots & \vdots \ \ldots & \vdots \\ x_{i1} & x_{i2} \ldots & x_{ij} \ldots & x_{im} \\ \vdots & \vdots \ \ldots & \vdots \ \ldots & \vdots \\ x_{n1} & x_{n2} \ldots & x_{nj} \ldots & x_{nm} \end{bmatrix} \tag{22}$$

2- Normalizing decision matrix by

$$r_{ij} = \frac{w_{ij}}{\sqrt{\sum_{i=1}^{m} w_{ij}^2}} \quad i = 1,2,\ldots,n \quad j = 1,2,\ldots,m \tag{23}$$

3- Weighting normalized decision matrix by multiplying normalized decision matrix and its' weights.

$$v_{ij} = r_{ij}.w_j \qquad i = 1,2,\ldots,n \qquad j = 1,2,\ldots,m \tag{24}$$

4- Determining positive and negative ideal solution as follows:

$$PIS = A^* = \{v_1^*, v_2^*, \ldots, v_m^*\} = \left\{\left(\max_i v_{ij} \mid j \in \Omega_b\right), \left(\min_i v_{ij} \mid j \in \Omega_c\right)\right\} \tag{25}$$

$$NIS = A^- = \{v_1^-, v_2^-, \ldots, v_m^-\} = \left\{\left(\min_i v_{ij} \mid j \in \Omega_b\right), \left(\max_i v_{ij} \mid j \in \Omega_c\right)\right\} \tag{26}$$

5- Calculating Euclidean distance of alternatives from positive and negative ideal solution as follows:

$$d_i^* = \sqrt{\sum_{j=1}^{m} (v_{ij} - v_j^*)^2} \qquad i = 1,2,\ldots,n \tag{27}$$

$$d_i^- = \sqrt{\sum_{j=1}^{m} (v_{ij} - v_j^-)^2} \qquad i = 1,2,\ldots,n \tag{28}$$

6- Calculating relative closeness of each alternative to ideal solution as below:

$$RC_i = \frac{d_i^-}{d_i^- + d_i^*} \qquad i = 1,2,\ldots,n \qquad RC_i \in [0,1] \tag{29}$$

7- Ranking alternatives according to their RC_i values in descending order from 1 to 0 and choosing the highest one.

4.4 VIKOR (Vise Kriterijumska Optimizacija I Kompromisno Resenje)

VIKOR (Vise Kriterijumska Optimizacija I Kompromisno Resenje) developed by Opricovic is a multi criteria decision making method (MCDM) based on creating compromised solution by taking alternatives and criteria into the consideration. Method is oriented for selecting and ranking alternatives in case of conflicting criteria (Büyüközkan & Ruan, 2008). Compromised solution is the closest to ideal one. In other words VIKOR based on measure of closeness to ideal solution is multi criteria decision ranking index (Opricovic & Tzeng, 2004). In order to obtain solution, closest to ideal one, multi criteria ranking index is generated for alternatives and then compared between the values of closeness to ideal solution (Opricovic & Tzeng, 2007). VIKOR has been applied in a number of fields such as evaluating banking perormance (Wu et al., 2009), public transportation analysis (Tzeng et al., 2005), selection of outsourcing providers (Liou & Chuang, 2010), material selection (Shanian & Savadogo, 2009).

Decision making process of VIKOR starts with problem definition. By this way aim of problem, alternatives, criteria and sub criteria (if needed) that will be evaluated are determined. Alternatives are selected, ranked and compared by utilizing cost or benefit based criterias. In evaluation process all alternatives get related criteria scores.

Steps of VIKOR method can be summarized as below:

a) Best (f_a^*) and the worst (f_a^-) values for each evaluation criteria are identified. If evaluation criteria (b=1,2,…,n) is based on benefit ;

$$f_b^* = \max_a x_{ab} \qquad f_b^- = \min_a x_{ab} \tag{30}$$

If evaluation criteria (b=1,2,…,n) is based on cost;

$$f_b^* = \min_a x_{ab} \qquad f_b^- = \max_a x_{ab} \tag{31}$$

b) In order to make comparisons normalization process is used and by this way normalization matrix is obtained. In normalization process decision matrix (X) ,composed of k criteria and l alternatives, transformed into normalization matrix (S) with same dimensions. Before normalization decision matrix (X) consisted of elements (x_{kl}) is seen as below;

$$X = \begin{bmatrix} x_{11} & x_{12}\dots & x_{1b}\dots & x_{1l} \\ x_{21} & x_{22}\dots & x_{2b}\dots & x_{2l} \\ \vdots & \vdots\ \dots & \vdots\ \dots & \vdots \\ x_{a1} & x_{a2}\dots & x_{ab}\dots & x_{al} \\ \vdots & \vdots\ \dots & \vdots\ \dots & \vdots \\ x_{k1} & x_{k2}\dots & x_{kb}\dots & x_{kl} \end{bmatrix} \tag{32}$$

After normalization process normalization matrix (S) consisted of elements (s_{kl}) is seen as below;

$$S = \begin{bmatrix} s_{11} & s_{12}\dots & s_{1b}\dots & s_{1l} \\ s_{21} & s_{22}\dots & s_{2b}\dots & s_{2l} \\ \vdots & \vdots\ \dots & \vdots\ \dots & \vdots \\ s_{a1} & s_{a2}\dots & s_{ab}\dots & s_{al} \\ \vdots & \vdots\ \dots & \vdots\ \dots & \vdots \\ s_{k1} & s_{k2}\dots & s_{kb}\dots & s_{kl} \end{bmatrix} \qquad s_{ab} = \frac{f_b^* - x_{ab}}{f_b^* - f_b^-} \tag{33}$$

c) Weighted normalized decision matrix (T) is obtained by multiplying criteria weights (W_b) and normalized decision matrix elements (S_{ab}).

$$T = \begin{bmatrix} t_{11} & t_{12}\dots & t_{1b}\dots & t_{1l} \\ t_{21} & t_{22}\dots & t_{2b}\dots & t_{2l} \\ \vdots & \vdots\ \dots & \vdots\ \dots & \vdots \\ t_{a1} & t_{a2}\dots & t_{ab}\dots & t_{al} \\ \vdots & \vdots\ \dots & \vdots\ \dots & \vdots \\ t_{k1} & t_{k2}\dots & t_{kb}\dots & t_{kl} \end{bmatrix} \qquad t_{ab} = s_{ab}.w_b \tag{34}$$

d) Values of S_a (mean group score) and R_a (worst group score) are calculated for each alternative.

$$S_a = \sum_{b=1}^{l} w_b \frac{f_b^* - x_{ab}}{f_b^* - f_b^-} \qquad R_a = \max_b \left[w_b \frac{f_b^* - x_{ab}}{f_b^* - f_b^-} \right] \tag{35}$$

e) Value of Q_a is calculated for each alternative. Values of S^*, S^-, R^*, R^- are used to acquire the value of Q_a. Additionally q parameter showing maximum group benefit states the weight of alternative providing maximum group benefit. On the contrary (1-y) parameter refers to weight of minimum regret. Compromise is reached by majority (q>0.5), consensus (q=0.5) or veto (q<0.5) (Opricovic & Tzeng, 2007). Generally q=0.5 is used (Lixin, Ying, & Zhiguang, 2008).

$$S^* = \min_a S_a$$

$$S^- = \max_a S_a \qquad Q_a = q\frac{S_a - S^*}{S^- - S^*} + (1-q)\frac{R_a - R^*}{R^- - R^*} \tag{36}$$

$$R^* = \min_a R_a$$

$$R^- = \max_a R_a$$

f) Values of S_a, R_a and Q_a are ranked from lower to higher and alternative having minimum Q_a value is controlled by two conditions whether ranking is accurate. These conditions are named acceptable advantage and acceptable stability.

Acceptable advantage condition: According to Q_a values first (Q(C_1)) and second alternative (Q(C_2)) satisfied significant difference. Calculated threshold value (DQ) depend on the number of alternative. If the number of alternative is lower than 4 the value of DQ equals to 0.25 (Chen & Wang, 2009).

$$Q(C_1) - Q(C_2) \geq DQ \qquad DQ = \frac{1}{k-1} \tag{37}$$

Acceptable stability condition: According to Q_a values first alternative (Q(C_1)) should get the best score at least one for values of S and R. Unless these two conditions are not satisfied, compromised solution set is formed by two ways:

1- If second condition is not satisfied, first and second alternatives are accepted as compromised solution.

2- If first condition is not satisfied, $C_1, C_2, \ldots, C_k$ alternatives are contained in compromised solution set according to $Q(C_k) - Q(C_1) \geq DQ$ (Opricovic & Tzeng, 2004).

Flowchart of FAHP-VIKOR and FAHP-TOPSIS methodologies are showed in Figure 2.

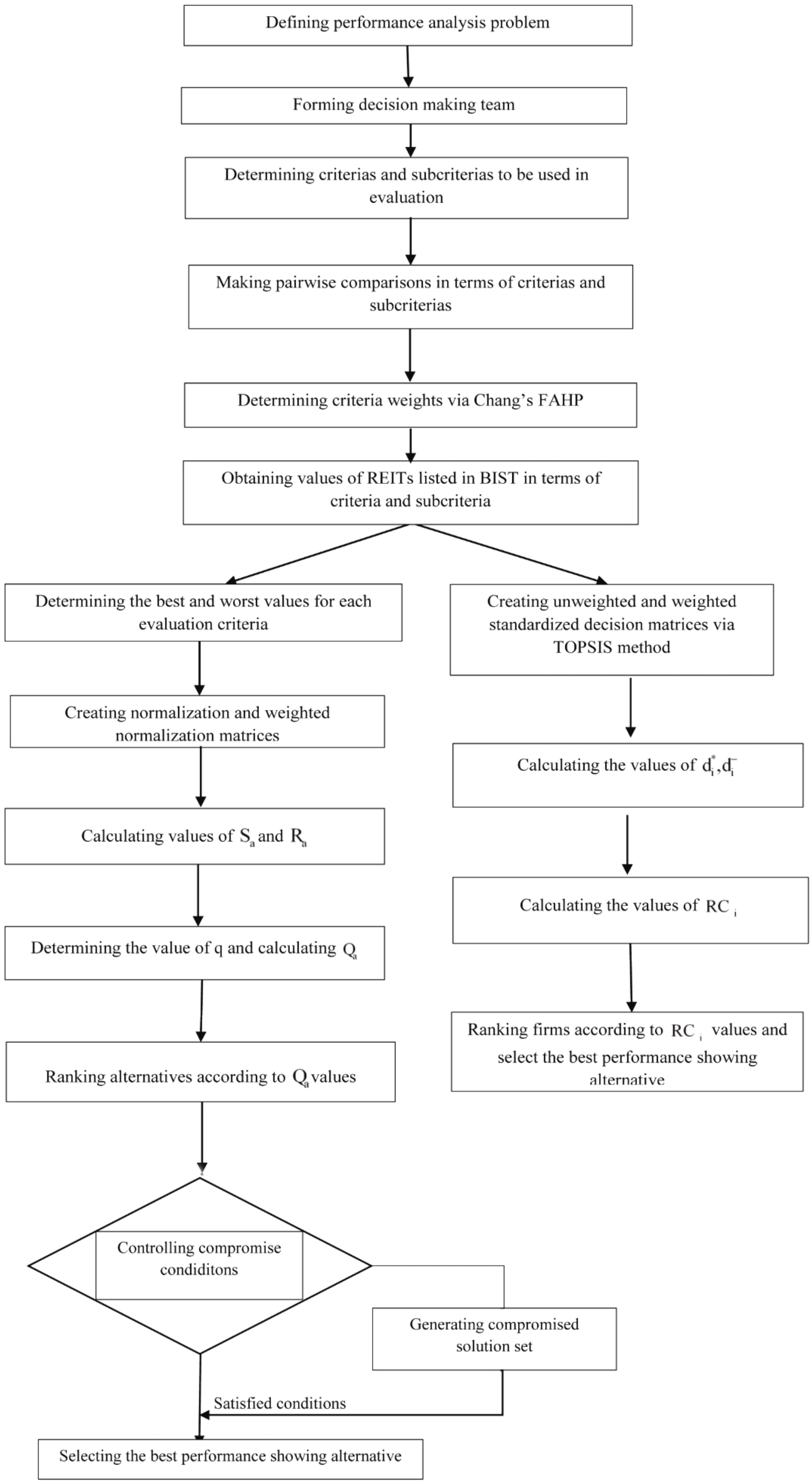

Figure 2. Flowchart of FAHP-VIKOR and FAHP-TOPSIS methodologies

5. Results

In application process a survey evaluating financial ratios was designed and conducted by face-to-face interview. Survey was applied between the dates 8 February 2016 and 20 February 2016 in order to determine weights of criteria for financial indicators. While defining the criteria, first of all, researchers made a depth literature review in order to develop the draft of the scale. 12real estate investment trusts (REIT) listed in BIST are taken into the consideration as alternatives.

Content validity is ensured by consulting to the experts' opinion (especially academicians' from finance field). After these procedures have been completed, data collection process started. Respondents were selected from financial experts worked in universities, public and private sector. Respondents were asked to compare four main criteria with respect to goal on a pair-wise basis to determine their relative importance. Also some demographic information towards respondents was collected and shown in Table 3. As a result, 17 complete surveys were collected and analyzed via Chang's FAHP method.

According to the results of FAHP weights of criteria are given in Table 4. For all comparisons including criteria consistency ratios are under the 0.1 threshold level so comparisons made were consistent. After the weights of criteria are determined, criteria related values of 12 REIT listed in BIST within the period of 2011-2015 are obtained from Public Disclosure Platform and firms' websites.

Table 3. Demographic variables of the study

Demographic Variables		**Frequency**	**Percent (%)**
Gender	Female	10	58.82
	Male	7	41.18
Age	18-30	1	5.88
	31-40	6	35.29
	41-50	7	41.18
	51-60	3	17.64
Experience in the finance	1-3	2	11.76
	4-6	1	5.88
	7-9	3	17.64
	10-12	6	35.29
	13+	5	29.41
Education	Bachelor's degree	2	11.76
	Post-graduate	7	41.18
	Doctorate	8	47.05
Institution	University (academicians)	8	47.05
	Public sector	4	23.52
	Private Sector	5	29.41

Table 4. Weights of financial indicators

Financial Indicators	**Weights**
Return on Assets	0.255596
Residual Income	0.249792
Economic Value Added	0.253283
Return on Sales	0.241329

According to the importance level of financial indicators, return on assets (ROA) was found as the most important criteria having the value of 0.255596. On the other hand return on sales was obtained as the least important one having the value of 0.241329. Relative closeness (RC_i) of each alternative and their rankings within the period of 2011-2014 are obtained via TOPSIS methodology and shown in Table 5.

Table 5. RC_i values and rankings of REITs according to descending order

	2011		2012		2013		2014	
Firms	RC_i	*Rank*	RC_i	*Rank*	RC_i	*Rank*	RC_i	*Rank*
NUGYO	0.363652	*9*	0.543981	*7*	0.55039	*5*	0.241236	*10*
KİLER GYO	0.527745	*3*	0.611882	*4*	0.449505	*9*	0.358172	*7*
OZGYO	0.565592	*2*	0.379978	*10*	0.546754	*6*	0.455646	*3*
AGYO	0.265579	*10*	0.867973	*1*	0.394781	*10*	0.328945	*8*
RYGYO	0.391972	*5*	0.574134	*5*	0.666109	*3*	0.303036	*9*
SNGYO	0.162617	*11*	0.376843	*11*	0.481068	*8*	0.585905	*2*
SAY GYO	0.658891	*1*	0.415573	*9*	0.48859	*7*	0.712948	*1*
TRGYO	0.474583	*4*	0.684152	*3*	0.681634	*1*	0.405697	*5*
TSGYO	0.372046	*6*	0.565475	*6*	0.555685	*4*	0.179965	*11*
VKGYO	0.44857	*12*	0.739762	*2*	0.681326	*2*	0.426156	*4*
YEŞİL GYO	0.370893	*7*	0.278034	*12*	0.341443	*12*	0.163785	*12*
YKGYO	0.368939	*8*	0.513973	*8*	0.377934	*11*	0.366939	*6*

According to the firms' ranking related to RC_i values YEŞİL GYO shows the worst performance and placed last in the years of 2012, 2013 and 2014; this condition is valid for VKGYO in 2011. However in the context of best financial performance SAY GYO places top position in 2011 and 2014. That is true for AGYO in 2012 and TRGYO in 2013.

By applying VIKOR methodology obtained S_a and R_a values for each REITs within the period of 2011-2014 are given in Table 6.

Table 6. S_a and R_a values of REITs

	2011		2012		2013		2014	
Firms	S_a	R_a	S_a	R_a	S_a	R_a	S_a	R_a
NUGYO	0.6662	0.2298	0.5204	0.2046	0.4471	0.1831	0.8334	0.2555
KİLER GYO	0.4621	0.2234	0.2738	0.1379	0.5499	0.2052	0.6950	0.2476
OZGYO	0.4318	0.1846	0.5939	0.2413	0.4231	0.1835	0.5569	0.1823
AGYO	0.7807	0.2413	0.1016	0.0821	0.6024	0.1937	0.7000	0.2263
RYGYO	0.7019	0.2497	0.4380	0.2442	0.2862	0.2497	0.7322	0.2497
SNGYO	0.8462	0.2532	0.5898	0.1903	0.5238	0.2413	0.3895	0.2279
SAY GYO	0.2276	0.2276	0.6126	0.2430	0.4976	0.1523	0.1829	0.1829
TRGYO	0.5267	0.2168	0.2218	0.1085	0.2917	0.1017	0.6078	0.1789
TSGYO	0.6567	0.2327	0.3947	0.2244	0.4055	0.1325	0.8466	0.2451
VKGYO	0.5749	0.2194	0.1218	0.1033	0.2349	0.1128	0.6009	0.2305
YEŞİL GYO	0.6270	0.2240	0.8418	0.2532	0.7695	0.2532	0.8697	0.2532
YKGYO	0.6950	0.2555	0.4333	0.2555	0.5483	0.2555	0.6781	0.2371

In order to obtain Q_a values of each alternative, consensus condition is considered and thus parameter (q) showing maximum group benefit is used as 0.5. Ranking of REITs in ascending order after acquiring Q_a values are shown in Table 7.

Table 7. Q_a values (q=0.5) and rankings of REITs according to ascending order

	2011		2012		2013		2014	
Firms	Q_a	*Rank*	Q_a	*Rank*	Q_a	*Rank*	Q_a	*Rank*
NUGYO	0.672929	*7*	0.635928	*6*	0.462957	*6*	0.973595	*11*
KİLER GYO	0.463023	*3*	0.277427	*4*	0.631075	*8*	0.821011	*8*
OZGYO	0.165058	*1*	0.791401	*10*	0.44192	*5*	0.294426	*2*
AGYO	0.846415	*10*	0	*1*	0.642705	*9*	0.685582	*6*
RYGYO	0.842448	*9*	0.694473	*8*	0.529164	*7*	0.862052	*9*
SNGYO	0.983689	*12*	0.641718	*7*	0.723814	*10*	0.470376	*4*

SAY GYO	0.302993	*2*	0.808923	*11*	0.410112	*4*	0.026468	*1*
TRGYO	0.468191	*4*	0.157561	*3*	0.053086	*2*	0.309321	*3*
TSGYO	0.685443	*8*	0.60827	*5*	0.259539	*3*	0.915003	*10*
VKGYO	0.525846	*5*	0.074969	*2*	0.035894	*1*	0.640665	*5*
YEŞİL GYO	0.600601	*6*	0.993334	*12*	0.992482	*12*	0.984918	*12*
YKGYO	0.877756	*11*	0.724246	*9*	0.793143	*11*	0.740488	*7*

According to the S_a, R_a and Q_a values acceptable advantage condition is satisfied for 2011 and 2014. For acceptable advantage condition, difference between first and second alternative having Q_a values are greater than or equal the threshold value (DQ = 0.090 for k=12). However according to Q_a values first alternative get the best score for values of S_a and/or R_a, thus acceptable stability condition is satisfied for four years period (2011-2014).

In terms of firms' ranking related to Q_a values YEŞİL GYO shows the worst performance and placed last in the years of 2012, 2013 and 2014 similar as ranking related to RC_i values in TOPSIS methodology. Apart from that SNGYO shows the worst performance in 2011.

However in the context of best financial performance, different firms place on the top for each year. In other words OZGYO, AGYO, VKGYO and SAY GYO place top position for each year respectively.

As a result both method give the same output in terms of finding the worst financial performance showing firm as YEŞİL GYO. Additionally they give similar and consistent results in the context of obtaining top five firms showing the best financial performance.

6. Recommendations and Future Research

There are not enough studies related to performance analysis of REITs operated in the world and especially for Turkey. In this study performances of REITs listed in BIST are analyzed in the context of different financial indicators and ranked via MCDM methods namely TOPSIS and VIKOR. For this purpose weights of financial indicators are obtained by Chang's extent analysis method on FAHP, one of the mostly used fuzzy ranking method. With these contributions it is aimed to fill the gap in literature. Ultimately both MCDM methods give the same results out of performance of VKGYO in 2011. For further researches it is recommended to integrate the different weights and ranking approaches with different financial indicators with respect to measuring performances of REITs.

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Abnormal Return, Market Reaction around Rating Announcement in Tunisian Stock Market

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Abstract

This paper tests the market reaction and the stock price change around rating announcements in Tunisian stock exchange using the event study methodology. We examine the impact of the change rating announcement on stock return firms from 2006 to 2010. The results show that only the negative rating with downgrades note which is associated to negative abnormal return. The market does not seem to be interested upgrades rating on the Tunisian market. The negative reaction of the market can be explained by leverage change, Book to Market ratio and the level of the rating fall.

Keywords: rating, abnormal return, event study

1. Introduction

The number of rating agencies increases in this decade; we estimate more than 100 rating agencies in the world. The role assumed by theses agencies become more and more important and theirs announcements constitutes an event that affect the market reaction and stock firm return. Analyzing the effect of rating agencies decision is an important event, essentially, to small markets. The rating announcement has solicited a reach literature in events studies literatures. The rating agencies evaluate firms using different criteria and standard processes, and thus theirs decisions can transmit a signal to the market. Lee-Hsien Pana et al. (2015) presents different indicators criteria used to evaluate firms: corporate transparency, firm performance and classify firms in five classes: the highest corporate transparency is notified to an A++ rating, firm with the lowest corporate transparency is C-rating. The five classes of rating is: (1) compliance with the mandatory information disclosures, (2) timeliness of information reporting, (3) disclosure of financial forecast, (4) disclosure of annual report, and (5) disclosure of corporate website. Before notification announcements, rating agencies collect financial information from public and private sources.

The change notification announcement transmits new information to the market; as a result, every degradation, downgrades and changes should have a negative effect on stock prices. Similarly, put under positive surveillance, upward revisions and positive changes should result improvement value. Thus, the impact of the company's notification variation on the share stock price can be explained by the effect of the new information announced to the market, any change in the rating is likely to affect the financial capital cost, their profitability, and consequently their market value. Similarly, the company's notification change can influence firm's growth and their future vale. Researches in the subject of rating have increasingly in vogue, but, the majority of these studies were conducted in developed markets. Rare papers that have tested market reaction in emerging market. Their reaction following rating announcements was always ignored, it must not also forget that the culture of using rating agencies is not developed enough and so this type of work allows, among others, to break the reluctance to seek rating.

The Tunisian capital market offers an interesting area to test the rating agencies' decision. We test the market reaction to rating agency announcements by measuring stock abnormal return. The market characteristics and the lack of prior studies motivate this research and form the basis for its contribution to the research literature. This paper evaluates the information value of Tunisian stock market after rating agencies announcements. The database of this study includes rating announcements for the period 1 January 2000 to 31 December 2010, of Tunisian rating agency. We use event study methodology to test stock abnormal returns around announcement date.

After a literature review of the main works that have approached the subject of rating in Section 2, we present our sample and methodology in Section 3, Section 4 will be devoted to the presentation of the results found, section 5 explains the causes of the market reaction to the rating announcement and we conclude in section6.

2. Literature Review

Reach literature test the effects of rating announcement to stock return and market reaction but results are mitigates. In developed market the majority of theses papers conclude the existence of an abnormal stock return markets to negative rating announcement (downgrades and negative review) but not to positive announcements (upgrades and positive reviews rating).

Literature in this area is rich, Dichev and Piotroski (2001) has primarily assessed the impact of ratings changes on the bond and stock markets, they finds that rating downgrades affect stock return and market reaction, but rating upgrades do not carry the same informative value.

According to Ederington and Goh (1998) most of the ratings downgrades are preceded by declines in firm income and analysts' forecasts. Goh and Ederington (1993) demonstrate that the rating announcement effect can be explained by the firm purpose. Announcements ratings driven by changes in the firm financial perspective, such as the possible income growth or debt increase, can have an impact on the stock market. Kliger and Sarig (2000) find that the information published by the rating anticipated by the market, has no effect on the firm value, they add that the stock price variation depends by unexpected changes rating. Elayan et al. (2003), analyzing the effect of rating announcement in New-Zealand rating, found abnormal stock return to positive announcements and suggested this reaction depend with corporate size. However, Abad-Romero and Robles-Fernandez (2006) in Spanish market: consider the absence of reaction to downgrades and negative announcement to upgrades. Koresh and Galil (2014) find that the market anticipates negative decision prior to the announcement date. Wengne et al (2015) examine the impact of rating events for the period 2004-2011. The results show that both downgrades and improvements ratings have an impact on the spread around announcement date.

To explain the effect of rating on stock prices, different hypothesis are presented: information content hypothesis, the signaling hypothesis and wealth redistribution hypothesis. Zaima and McCarthy (1988) analyzes information content hypothesis, they considers that the rating agencies provide additional information to the market about firm value. Ederington et al. (1989) suggest that ratings have greater information content than the market stock price since it includes private information collected by the rating agencies. Akhigbe et al. (1997) test signaling hypothesis, they consider that a rating change can be seen as a signal to the market about future profits, opportunity and cashes flows of firms. The hypothesis of wealth redistribution as defined by Zaima and McCarthy (1988), find the existence of a conflict of interest between bondholders and shareholders. Thus, lowering the rating reduces the bond price, which is expropriated from bondholders to shareholders and then increasing the share price. Romero and Fernandez (2006) indicate that ratings downgrades have no effect in the stock price but rating upgrade announcement generates significant impact on the Spanish market. They explain this behavior by the wealth redistribution hypothesis. Steiner and Heinke (2001) conclude that the factors explaining the market reaction is Downgrades into speculative class. Gropp and Richards (2001) analyzes rating change announcements on European banks. They attribute the effect on stock price to the Expected announcements hypothesis.

3. Data and Empirical Methodology

3.1 Data

Our database includes 67 rating announcements for the period between 1997 to, 2012, collected from Tunisian Stock Exchange (TSE), classified as 33 negative rating and 34 positive rating. In Tunisia there is only one rating company that evaluates Tunisian firms: “Maghreb Rating”. We consider negative rating announcements in the cases of: downgrade note, negative review, downgrade and negative review; negative outlook revision or current rating confirmation. Furthermore, rating agencies, in most cases, confirm the latter notation. We considered any confirmation following degradation as a negative rating.

We classified the positive rating announcements to the following categories: upgrade; positive review; upgrade and positive review; positive outlook revision or current rating confirmation, ending a negative review.

3.2 Econometric Model

To test the impact of announcements ratings on the stock return, we follow Fama et al. (1969) procedures and terminology. We calculate daily abnormal returns and cumulative abnormal returns on an event period that begins twenty days before the announcement to twenty days after this day.

In this study, we analyze the impact of ratings change announcements on the underlying issuer's share price. The estimation window, runs from 60 trading days before the announcement date, t=0, to 10 days before the announcement date. The event window runs from t =-10 to t=+10 (ten trading date after announcement date). To test the effect of ratings change announcements to the stock price, we calculate daily abnormal returns and cumulative abnormal returns during the event window.

To calculate abnormal returns, we use the market model and we calculate "normal "returns in the period before event (sixty days before announcement to ten days before this day).

We use the market model to calculate the estimator: $\alpha_i, \beta_i et \varepsilon_{it}$ for each share, this model was estimated as follow:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

$$E(\varepsilon_{it}) = 0 \text{ and Var } (\varepsilon_{it}) = \sigma i2$$

R_i and R_m are the day returns of equity i and the market index.

We calculate the abnormal return on day t for share i (RA_{it}) as follow:

$$RA_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt}; \quad \text{i =1…N} \tag{2}$$

RA_{it}: abnormal return on day t for share i. t=0 is the announcement day.

$$E(R\hat{A}_{it}) = RA_{it} = \alpha_t + \beta_t R_{mt} \tag{3}$$

$$\text{and } V(R\hat{A}_{it}) = \theta^2 \sigma^2{}_i$$

To test the significance of the average residuals we uses student test "Tpar", the cross (Note 1) test, and signe test "T signe". We calculate the cumulative abnormal return CAR in the windows of t=-60 to t =-10.

4. Empirical Result

The abnormal returns around rating announcement are presented in Tables 1 to 4. In Tables 1 and 2, the sample is classified in financials and non financials companies for negative (in Table 1) and positive rating (Table 2). We find that the stock price reaction to positive and negative rating announcement is more important and significant for financials companies. The market seems to be more interested in the rating announcement of Tunisians banks.

Table 3 present the abnormal return of stocks around announcement day of negative rating, the result is negative and statistically significant (-0.48%) in the announcement day (t=0). We find significant abnormal return responses following downgrades rating announcements. We consider that downgrades generate stronger and more predictable results than upgrades. We conclude then, the negative and significant stock price reaction to negative rating announcement. The negative reaction persists and these downward trends continue six days after announcement day (graph n°1).

Rating downgrades announcement generate stronger and more predictable results than upgrades, which is in line with the majority of the financial literature dealing with rating changes.

Generally, the rating agency publishes the future prospects for long-term, and prior changing notification, decides to put firm under surveillance. This procedure helps investors to anticipate the rating degradation and react even before the public announcement, this explain the week market reaction to the negative rating announcement compared to other financial market.

The decision to revise the rating down is seen as a bad signal by investors. They are aware about the future firm performance and react, then, before the event date. Generally, when the information is made public, all investors are informed and the event loses its information relevance.

According to the table (3), the positive rating announcement does not influence the abnormal returns. This result corroborates those of Barron et al. (1997), Li et al. (2004) but contradicted those of Elayan et al. (2003) and Creighton et al (2006) who found a significant response after positive negative ratings announcements.

In Tunisian market, the positive rating announcement is not considered by investors as favourable information. Consequently, the upgrading rating may reflect a prudent corporate behaviour.

The negative reaction to downgrades rating leads us to search the factors that have caused this abnormal return. Various variables are presented to explain this reaction.

Table 1. Cumulative abnormal return to downgrade rating announcement

	Sample 1: Financial Companies				Sample 2: Non Financials Companies			
Event period	(0;20)	(-20;20)	(-1;1)	(-5;5)	(0;20)	(-20;20)	(-1;1)	(-5;5)
Mean	0.001408	0.002087	-0.004447	8.54E-05	-0.000317	-0.000734	0.000496	-0.001194
Mediam	0.001769	0.001988	0.000589	0.000327	0.000326	-0.000369	-0.000580	0.000678
STD	0.004483	0.007304	0.028114	0.005712	0.003079	0.003365	0.015090	0.005908
t-test	**2.486522**	**2.092241**	0.528580	0.868522	0.676717	0.844356	0.054444	0.888038
p-value	0.0174	0.0432	0.6002	0.3906	0.5051	0.4068	0.9570	0.3833
test wilcoxon	2.907885	2.366883	1.257829	1.582430	0.256410	0.256410	0.358974	0.000000
p-value	0.0036	0.0179	0.2085	0.1136	0.7976	0.7976	0.7196	1.0000

Table 2. Cumulative abnormal return to upgrade rating announcement

	Abnormal return: ***Financials companies***				Abnormal return: ***Non Financials companies***			
Event period	(0;20)	(-20;20)	(-1;1)	(-5;5)	(0;20)	(-20;20)	(-1;1)	(-5;5)
Mean	0.000368	0.001455	0.009396	-0.000809	-0.000637	0.001854	0.008687	-0.000398
Mediam	0.000178	0.000916	0.002406	-0.000500	-0.002015	0.001019	8.50E-06	-3.55E-05
STD	0.002840	0.002415	0.018271	0.005044	0.004359	0.004085	0.024031	0.007953
t-test	1.077323	1.423692	**2.502963**	0.414889	0.041970	1.543193	1.317036	0.087082
p-value	0.2875	0.1619	0.0163	0.6803	0.9669	0.1370	0.2014	0.9314
test wilcoxon	1.279258	3.321377	2.288581	0.035209	1.010363	0.837158	0.144338	0.202073
p-value	0.2008	0.0009	0.0221	0.9719	0.3123	0.4025	0.8852	0.8399

Table 3. Abnormal return around negative rating

	RAM	**RAC**	**T1 student test**	**T2 rang test**	**T3 sign test**
-5	0,000	-0,001	0,235	0,870	0,360
-4	0,001	0,000	0,612	0,174	-0,627
-3	0,002	0,003	0,960	1,914	0,997
-2	-0,001	0,001	-0,651	0,174	-1,107
-1	0,002	0,003	0,764	0,870	-0,246
0	-0,004*	-0,001	**-1,681**	**-0.522**	**-1,575**
1	-0,000	-0,002	-0,287	0,174	-0,480
2	-0,003	-0,005	-1,049	0,522	-0,984
3	-0,001	-0,006	-0,490	0,870	-1,194
4	-0,000	-0,006	-0,061	-0,522	-1,034
5	0,001	-0,005	0,625	1,218	0,590

RAM: Average abnorma return, RAC: cumulative abnormal return, T1: student test; T2: rang test; T3: sign test. * significativity to 10%; ** significativity to 5%.

Table 4. Abnormal return around positive rating

	RAM	**RAC**	**T1 student test**	**T2 rang test**	**T3sign test**
-5	-0,027	-0,153	-1,556	0,000	-1,854
-4	-0,032	-0,185	-1,823	0,000	-1,576
-3	-0,038	-0,223	-2,161	-0,342	-0,015
-2	-0,045	-0,269	-2,584	-0,685	-1,669
-1	-0,045	-0,315	-2,564	0,000	-1,561
0	-0,042	-0,358	-2,414	1,371	1,391
1	-0,037	-0,395	-2,098	1,028	0,973
2	-0,036	-0,432	-2,071	1,371	0,772
3	-0,037	-0,470	-2,135	-1,028	-1,190
4	-0,039	-0,509	-2,228	1,028	0,108
5	-0,037	-0,547	-2,114	1,028	0,046

RAM: Average abnorma return, RAC: cumulative abnormal return, T1: student test; T2: rang test; T3: sign test.

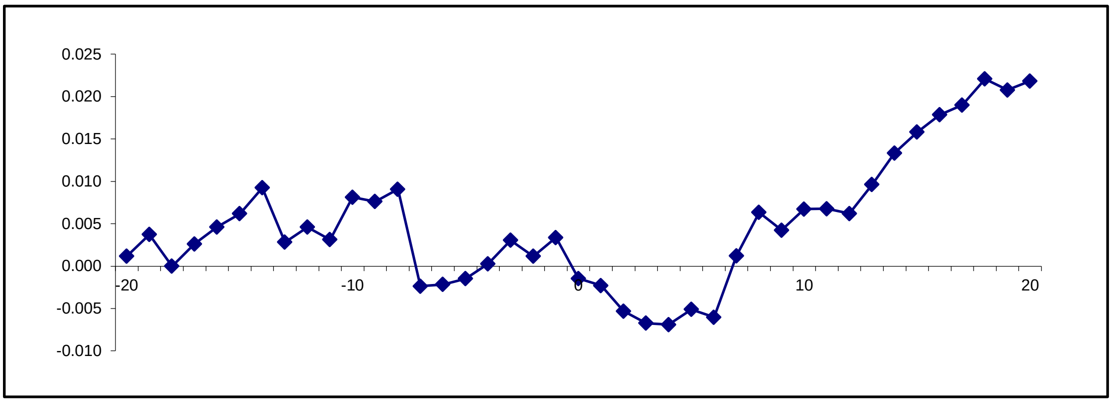

Figure 1. Stock price reaction to downgrade rating announcement

Figure 1 shows slightly positive pre –downgrade abnormal return, this reaction is followed by sharp negative reaction with sharp negative CARs following the rating downgrades announcements. Then, the pattern reverses again and we the abnormal return increase 7 days after announcement. The results from upgrade announcements were not statistically significant.

5. Factors Explained Market Reaction

Financial literature analyzing rating effect on stock market concludes that the size (total assets or total sales) of an issuer is an important factor explaining the market reaction. Others authors use total assets, leverage, profitability Return on assets ROA as independent variables. Since rating process between financial and non-financial firms is different, we utilize a dummy variable to distinguish them. FN is 1 if the rating changes apply to financials firms.

The effect on stock price at announcement day can also explained by frequency of downgrades, upgrades or if the firm is putted on surveillance. Make to negative surveillance transmit a signal to the market that the firm is in difficulty and prepare the downgrade. The market can then expect the future rating announcement. Hence we define MS as dummy variable equal to one if company is make to surveillance in the preceding rating and 0 if not.

We also test the hypothesis that equity markets will react more strongly to rating change announcements for firms with speculative grade ratings than to those with investment grade ratings. We consider DR dummy variable equal to 1 if the rating change is from speculative grade note (BB+/BB1 or lower) and 0 otherwise.

Book to market ration BTM measure the market performance at the announcement date of rating.

Independents variables	Expected Signs
Size (Log VM)	(+)
Leverage (ED)	(-)
BTM	(-)
Dowongrade (DR)	(-)
Make on surveillance (MS)	(-)
Financials companies (FN)	(-)

To explain the market reaction to the negative announcement we use model follow:

$$CAR_i = \beta_0 + \beta_1 \log(VM)_i + \beta_2 ED_i + \beta_3 BTM + \beta_4 FN_i + \beta_5 DR_i + \beta_6 MS_i + \varepsilon_i \tag{4}$$

In this model DR, FN et MS are binary's variables: FN=1; if financial firm and 0 if not

DR =1 if the rating note is low then (3B) and 0 if not, MS=1 if the announcement proceeded by make on "negative surveillance".

VM: Firm size measured by log of the market value of equity; ED: firm leverage: the debt ratio, measured by total debt to book value of assets; BTM: is the book to market ratio.

Table 5. Factors explained market reaction

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009452	0.005581	-1.693590	0.1023
VM	0.002043	0.001566	1.304954	0.2033
ED	0.008940*	0.005245	1.704592	0.1002
BTM	**-0.000375****	**0.000177**	**-2.119326**	**0.0438**
DR	-8.85E-12*	5.12E-12	-1.728938	0.0957
MS	0.000484	0.001606	0.301304	0.7656
FN	-0.000268	0.001575	-0.170269	0.8661
R-squared	0.311753			
Adjusted R-squared	0.152927			

FN=1; if financial firm and 0 if not; DR =1 if the notification is low then (3B) and 0 if not, MS=1 if the announcement is related to make on negative surveillance.VM: firm size measured by log of the market value, ED: firm leverage: the debt ratio , measured by total debt to book value of assets. (BTM) is the book to market ratio.

From the Table 5, we can conclude that the negative abnormal return around announcement can be explained by firm leverage, profitability and the level of downgrades. For rating downgrades, we confirm that rating downgrades for speculative grade firms have more severe price reactions than those for investment grade firms.

The results show that the debt ratio is a significant variable and that the relationship between debt ratio and the abnormal return is positive. This result confirms Li et al. (2004) and Li et al. (2006), who concluded that the debt ratio is correlated to the rating downgrade, expressing the deterioration of the company's financial structure.

Our result demonstrates that firm size is not significant and does not explain the market reaction to the announcement. This corroborates the results of Li et al. (2004) that find no effect of size on the abnormal return. Note also that the ratio Book to Market has a significant effect and can explain the market reaction at the announcement date.

We conclude also the negative impact of BTM on the abnormal return following announcements dates. Investors believe that the company's value is less than the book assets after negatives ratings announcements.

The level rating “downgrade” has a strong significance explaining the abnormal return, this variables is correlated to the level of lowest rating (below BBB). This results confirms those of Holthausen and Leftwich (1986), Jorion and Zhang (2005) who considers that the downgrade from one class to another are associated with significant negative abnormal return. Similarly, Creighton et al. (2006) show that in the case of the downgrade, ad effects are greater.

6. Conclusion

In this paper we tested the impact of rating changes on stock return in of Tunisian stock market. We applied the event study methodology and used two nonparametric tests and student test: test and sign rank test. Our results demonstrate that the market only react to degradations announcement of rating.

When the announcement is related to improvement notification, there is not an abnormal return around this date. We can conclude that the market was anticipated the event before his announcement, this information was used prior to its public divulgation.

To explain this market reaction to negative rating announcement, abnormal return is tested by different variables related to characteristics of firm, the operation and financial market. We have identified significant effects for the debt ratio, the ratio Book to Market and level of “downgrade”.

These results corroborate studies Li et al. (2004), Holthausen and Leftwich (1986), Jorion and Zhang (2005) and Creighton et al. (2006). It appears that the announcement of such information on the situation of the company led to a negative impact on stock prices. This reaction occurs on the day of the announcement and continued several days later.

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Note

Note 1.

T cross = RAM/SRAMi

$$SRAM_t = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(RA_{i,t} - RAM_t)^2}$$

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A Review of the Relationship between Corporate Financial Performance and the Level of Related Party Transactions among Listed Companies on Tehran Stock Exchange

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Abstract

The main objective of the investors to invest in stocks is to earn a profit and this is achieved by firm performance improvement. So the investors analyze various kinds of financial performance data for the different kinds of business models to determine whether some models perform better than others.

The present study aims to collect the evidences of the relationship between firm economic performance and the level of related party transactions on Tehran Stock Exchange. So far, empirical evidences are not provided to reveal a clear picture of the reasons behind the related party transactions in Iran. In the case of opportunistic behavior in transactions, it is expected that the level of related party transactions has a relationship with economic performance variables. The research data have been collected over 1387-1393 for companies listed on Tehran Stock Exchange and to test the hypotheses, multivariate regression analysis of panel data is used. The results indicate that at a 95% confidence level, the economic value added (EVA), refined economic value added (Reva) and the market value added (MVA) variables have a significant relationship with the level of related party transactions.

Keywords: related party transactions, Economic Value Added (EVA), Refined Economic Value Added (REVA), Market Value Added (MVA)

1. Introduction

The development of rapidly growing numbers of large different companies is one of the "outstanding characteristics of our century". The joint stock companies are formed by the growth of capital markets and attracting small and large investments in economic sectors to achieve profits such as economies of scale, diversification of investments and maximizing the overall portfolio's risk-adjusted return.

The companies that in their ownership structure managers are not necessarily wealth owners. So this case raised the issues such as agency costs and the conflicts of interest between management and shareholders. However the primary objective of financial reporting is to provide useful information for decision making. In this regard, when a firm shows higher accounting quality in its financial reporting, it can take better economic decisions. In this article a general idea of the topic and the necessity of this study are introduced then an overview of the research methods and variables are presented. The main contribution of this research is to review the relationship between corporate economic performance and the level of related party transactions in companies listed in the Tehran Stock Exchange to help financial statements users to take right financial decisions.

2. Statement of the Problem

Controlling shareholders transfer the assets and profits out of minority shareholders through related party transactions. The so-called tunneling is used to determine the deviation of interests at the expense of minority shareholders in the company (Johnson et al., 2000). According to the Liu and Lu (2007), tunneling is the expropriation of the minority shareholders wealth by controlling shareholders. The researchers stated that tunneling conceals the company's actual performance and controlling shareholders private profits from other stockholders which is usually detrimental to minority shareholders. In practice, this definition of tunneling is true for a company that transfer its profits to a related or unrelated party out of the company.

According to Accounting Standard No. 12, in Iran a related party transaction is a transfer of resources, services or obligations between related parties, regardless of whether a price is charged. According to this standard a party is a related party if any of the following conditions applies:

a-Directly or indirectly through one or more intermediates

1)-Has control or joint control over the reporting entity (Including the main business units, subsidiaries and fellow subsidiaries);

2)-Has significant influence over the reporting entity; or

3)-Has a joint control on reporting entity.

4)-Is a member of the key management personnel of the reporting entity or of a parent of the reporting entity.

b-One entity is an associate of the other entity

c-One entity is a joint venture of the other entity

d-Is a member of the key management personnel of the reporting entity or of a parent of the reporting entity.

f-Is a close member of the person's family who are identified in (a) or (d).

g-The entity is controlled or jointly controlled by the persons identified in (d) or (f) Or that a significant share of the voting rights directly or indirectly are available to them, and

h-The entity is a post-employment benefit plan for the benefit of employees of either the reporting entity or an entity related to the reporting entity. If the reporting entity is itself such a plan, the sponsoring employers are also related to the reporting entity.

Related party transactions can be done in different ways, including the purchase or sale of goods, purchase or sale of non-current assets, providing or receiving services, leasing, transfer of research and development projects, patent purchase agreement, long-term and short-term financing, guarantee and collateral agreement, and debt arbitration of the entity or by the entity on behalf of another person (Iranian accounting standard No. 12).

Controlling shareholders that own X% of the company's stock are not satisfied but they want to own in addition some other extractable private profits from the company. In contrast, minority shareholders with y% stake in the company, do not expect to achieve their exact value, but they are underachieved because of y% minus stake in the company and also minus what the controlling shareholders may pursue as their private interests. The rate of the private interests of controlling shareholders depends on corporate governance structure.

Based on Iranian accounting standards, control means the ability to direct the financial and operational policies of a firm to achieve economic benefits from its activities. So controlling shareholders have the power to control the core of the company's decisions and policies.

Based on Regho (2007) and Jahang et al. (2007) empirical researches, a significant portion of related party transactions are based on unfair non-market prices.

A related party relationship could have an effect on the profit or loss and financial position of an entity. Related parties may enter into transactions that unrelated parties would not.

For example, an entity that routinely sells goods to its owner at cost would probably may not routinely enter into transactions to sell goods to its other customers at cost. In addition, the transactions between related parties may not be made at the same amounts as between unrelated parties (article 8 of Iranian accounting standard 12).

The profit or loss and financial position of an entity may be affected by a related party relationships even if related party transactions do not occur. The mere existence of the relationship may be sufficient to affect the transactions of the entity with other parties. For example, a subsidiary may terminate relations with a trading partner upon the acquisition by the parent of a fellow subsidiary that is engaged in the same activity as the former trading partner. Alternatively, one party may refrain from acting because of the significant influence of another—for example, a subsidiary may be instructed by its parent not to engage in research and development. There are two proposed views about the uses of related party transactions. The first view is Propping-up hypothesis which suggests that transactions with related parties are applied in companies which have poor performances (Friedman et al., 2003). Bertrand et al. (2002) and Jiang and Wang (2010) have documented when there is incentives to meet profit targets, related party sales are used to reduce negative effects of industry shocks on listed firms profits. Another hypothesis in regard to related party transactions, is internal capital market theory which is derived from Coase (1937) and Williamson (1964) transaction cost theory. This hypothesis implies that related party transactions are used as an alternative to foreign trading markets. Domestic capital market has costs and benefits .The benefits include how resources are allocated and is associated with economic efficiency and maximization of utility, better coordination between different sources, faster feedback and the mutual transfer of knowledge. Costs related to the domestic capital market sectors include opportunistic behavior of managers (Charfsten & Stein, 2000) and inefficient allocation of resources (Charfsten, 1998). These costs are mainly caused by agency costs. Ownership of agency issue is a principle topic in corporate governance. For companies with extensive properties, the main concern is how the interests of managers and shareholders are aligned although the professional managers are accountable to shareholders. In contrast, in companies with concentrated ownership structure, the basic question is how conflict of interests between controlling shareholders and minority shareholders can be resolved.

Shleifer and Vishny (1997) stressed that although large shareholders can be very effective in solving the agency problem, In this case, large owners might be costly as they can redistribute wealth in both efficient and inefficient way from minority shareholders (Shleifer & Vishny, Large shareholders and corporate control, 1986). Cost of ownership concentration means abuse of control rights by majority shareholders to increase their wealth at the expense of minorities, Ownership concentration, aligned with more power of controlling shareholders led to the expropriation of minority shareholders (La Porta et al., 1999). Since there are several important and influential shareholders, they have different preferences in related parties transactions. What is best for the biggest shareholder, may not be best for the second- and third-largest shareholders and Private benefits of control may not be divided fairly or equally between them. When one of the major shareholders receives fewer benefits from related party transactions he/she may disagree with such transactions. So the balance of control may reduce related party transactions. In other words, control dispersion is a mechanism for interest deviation reduction (Bendsen et al., 2000). Based on the Chen and Wang (2005) research on Chinese companies over 1998-2002, there have been more balance between controlling shareholders, when the number of firms shareholders increased by more than ten percent. As a result, the amount and number of transactions with related parties decreased. With regard to the above issues the research questions are as follows:

The first question: Is there any significant relationship between economic value added (EVA) and the level of related party transactions?

The second question: Is there any significant relationship between refined economic value added (REVA) and the level of related party transactions?

The third question: Is there any significant relationship between market value added (MVA) and the level of related party transactions?

3. Research Background

Ismail (2006) study examined the relationship between economic value added (EVA) and total stock return. He also studied stock returns and accounting earnings and found that operating profit after Tax/net profit after tax variables as control variables in the model that increases the coefficient of determination in relation to efficiency and economic value added. In addition, he found that accruals and operating cash flow have significant effects on the economic value-added information content.

Elmir and Seboui (2008) reviewed corporate governance and the linkage between economic value added (EVA) and created shareholder value. They concluded that there was a weak correlation between economic value added (EVA) and the shareholders created value. In this study, conducted over 1998-2004, the explanatory power of the shareholders created value based on economic value added was 7%.

Mittal et al. (2008) reviewed the relationship between corporate performance and the economic value-added. They used social responsibility and ethical standards to measure company performance. Their finding indicated that there was not any significant relationship between economic value added and corporate social responsibility.

Song et al. (2009), studied the relationship between corporate governance mechanisms and related party transactions in companies listed on China's stock over 2002-2006. The results showed that the level of related party transactions increased in companies with higher ownership concentration, but it reduced when second and third major shareholders had strong bargaining power. Evidences also indicate that high rewards for external managers is along with increasing related party transactions, while the aim of an average increase in the three chief executive officers (CEOs) bonuses is the reduction of related party transactions, however ,if the chief executive officer (CEO), also serves as chairman of the board the level of related party transactions is increased .

Jian and Wong (2010) pointed out propping acts by controlling shareholders through related party transactions. They used data on related-party transactions of all listed Chinese firms from 2002 to 2008. They found that controlling shareholders prop up earnings by using abnormal related sales. Such propping acts more prevailed in state-owned companies and in areas where the economic situation is weaker.

Anil K. Sharma, Satish Kumar (2010) presented a narrative literature review of the papers published on the economic value added (EVA). They found that economic value added was a measurement tool for firm performance which created value insider CEOs and outsider CEOs.

Yin-Hua Yeh et al. (2012) In their study explored how corporate governance affects the level of related party transactions (RPTs) in Taiwan. The empirical results showed that good corporate governance was effective in constraining related-party transactions (RPTs). The findings also indicated that if the firms plan to issue seasoned equity next period to raise its earnings, there is a positive relationship between related parties transaction and profit reduction. The internal capital market hypothesis indicates that the level of related lending and guarantee (related borrowing) is negatively correlated with the condition of an increase in capital expenditure and an increase in net working capital.

Nicola Moscariello (2013) studied the motivations behind related parties transactions in Italian listed companies. His aim was to identify the reasons behind the transactions with related parties and efficiency or opportunistic features of these transactions. Given the ownership structure in Italian companies, major shareholders use related party transactions to expropriate the wealth of minority shareholders The evidences also showed an opportunistic behavior in these transactions and there was a significant relationship between these transactions and propping up motivations variables.

Nthoesane (2014) examined various aspects of the economic value added in “research literature”. In his view, economic value added is a good tool for measuring the capacity of the management to create value, and it also used to calculate their bonus. However, by reviewing the researches in this field he believes that there is not any relationship between economic value added and Executive compensation, so shareholders do not consider EVA as a proper basis for performance measurement.

Machuga, Pfeiffer, and Verma (2014) in their “economic value added, future accounting earnings and financial analysis in relation to equity return prediction” paper concluded that related party transactions refinement gave extra information to justify future equity variation and also cash flow and income accruals.

Cheong et al. (2014) studied the related parties transactions in listed companies in Hong Kong stock exchange.The results showed that on average, companies which involved in related party transactions earn negative excess return over time periods of up to12 months. This return is significantly low compared with similar transactions fair returns. Excess return has a negative linkage with controlling shareholders ownership percent and Alternative information disclosure policies.

Shariat Panahi and Badavar Nahandi (1384) reviewed the relationship between refined economic value added (REVA) and stock returns. They concluded that refined economic value added (REVA) has a very weak relationship with “variables of the reward to variability” and “ratio of the reward to variability”.

Vadiee and Razavirad (2008) in a survey examined the effect of capital on market value added. They concluded that, announcing the news of increasing the capital from cash receivables and share holders’ demands affect on the increasing the market value added. To raise equity capital from cash injection and shareholders demand affect on reducing the market value added. Increasing capital from retained earnings has less effect on market value added than shareholders cash injection. In this study, managers are recommended that when the cost of financing through shareholders cash injection is high, they can provide their finance through debt such as bank loans but in situations where the company has profitable investment opportunities, the finance is provided through shareholders cash injection.

Namazi, Heidar Pour, and Mohammadi (1388) in their study investigated the effects of shareholders composition on trading volume and their shares liquidity. In this regard, four hypotheses were supposed in two groups and the relationship between variables were reviewed using correlation method. To investigate the hypothesis, first single-variable correlation coefficient between the predictor variables (individual and institutional shareholders percent) and dependent variables (trading volume and liquidity of shares) were measured. According to the test results, any evidences were not found that share liquidity and trading volume have a linkage with institutional (legal) or non-institutional (natural) shareholders composition.

Khodadadi and Tucker (1390) examined the impact of corporate governance features including the concentration of ownership, institutional investors, government ownership, managerial ownership, duality of the director duties and the percentage of outside directors on the board on the financial performance and firm value. In this context, data from 80 firms listed in Tehran Stock Exchange in the period from 1384 to 1387 were used. The results indicated that the concentration of ownership and state ownership have a positive and significant correlation with the performance and the firm value. Major institutional investment had a positive relationship with the firm value but it had a negative relationship with firm performance. The issue of separating the roles of chairman and CEO had a significant and negative correlation with firm value but this correlation was not significant with firm performance. Also the corporate governance structure had a positive and significant relationship with the firm value and performance .

Mehran and Safarzadeh (1390) examined the relationship between corporate governance and earnings quality. In this study, a variety of approaches, including seven methods used to measure earnings quality. The results indicated that corporate governance had a negative and significant linkage with accrual quality standards, earnings persistence, earning smoothing and earning conservatism, and also it had a significant and positive correlation with earnings predictability and asymmetry timeliness of profit. But the findings are not significant for earned value management (EVM). The breakdown of corporate governance index to its components had reduced the explanatory power of the models.

Badavar and colleagues (1390) examined the relationship between corporate governance and accounting conservatism. They found that conservatism had not any significant relationship with institutional ownership, ownership concentration and independence of board members.

Setayesh and ebrahimi (1390) examined the impact of the corporate governance mechanisms on profit information content of listed companies on Tehran's Stock Exchange. In this regard, the effects of ownership concentration variables, managerial ownership, institutional ownership, corporate ownership, board of directors' composition and size on earnings response coefficients were investigated. The results indicated that among research variables only earnings information content had a positive and significant relationship with the ownership concentration and institutional ownership.

Mehrani and colleagues (1390) reviewed the impact of corporate governance mechanisms on earnings management intensity reduction. In this study, logistic regression and Mann-Whitney U test were used. The results showed that the research independent variables cannot limit the aggressive behavior of earnings management. Only if the unmanaged profit was less than last year's reported earnings, non-executive directors reduced such practices to a certain extent.

Talebnia and Shoja (1390) tested the relationship between market value added (MVA) to earning ratio with economic value added (EVA) to earning ratio in listed companies in Tehran Stock Exchange. Their aim was to find an internal performance standard that can be considered as a representative of market value. The findings indicated that there is a positive but weak relationship between market value added to the earnings ratio and economic value added to the accounting earnings ratio. So, from the perspective of the researchers, economic value added to the earning ratio as a measure of internal evaluation model cannot be an efficient standard for market value prediction.

Abbasi and Rastgarnya (1391) examined the impact of ownership structure (concentration and composition) on firm value in Tehran's Stock Exchange. In this respect, 69 firms over1384-1388 have been reviewed. The results showed that major shareholder ownership concentration, major shareholder logarithmic variable, Herfindahl–Hirschman index, (HHI) had not any significant relationship with corporate value. On the other hand the major shareholder ownership concentration and its logarithmic variable had a meaningful relationship with the firm value.

Moghaddam and Kazemipour (1391) evaluated the "effect of private ownership on the economic value added and return on investment (ROI) in companies listed on Tehran Stock Exchange". Since privatization in recent years has been so highly regarded so it is important to review long-standing and successful privatization programs. This research was conducted over 1383-1386 and its statistical population included all companies listed on Tehran Stock Exchange. The results suggested that the percentage of private sector ownership had a direct and significant relationship with return on assets and economic value added. Also 14 percent economic value-added and 7% rate of return on assets variations were determinable based on the percentage of private ownership. So there was a significant relationship between the rate of return on assets and the economic value added, but ownership concentration and CEO composition had an insignificant positive relationship with technical performance.

Jalili et al. (1393) assessed "A class of financial metrics that are used to assess a business's ability to generate earnings and financial values to express stock returns of listed companies on Tehran Stock Exchange". The results indicated that among the studied independent variables, economic value added and net income had a significant relationship with equity returns. Other independent variables, as the market value added, cash value added, return on assets and return on equity significantly correlated with stock returns, but this relationship is not as significant as economic value added.

4. Research Hypotheses

By considering the theoretical foundations in this study the reviewed performance criteria included economic value added (EVA), refined economic value added (REVA) and market value added (MVA). The research hypotheses are formulated as follows:

First hypothesis: there is a significant relationship between the economic value added (EVA) and the level of related party transactions.

The second hypothesis: there is a significant relationship between the refined economic value added (REVA) and the level of related party transactions.

The third hypothesis: there is a significant relationship between the market value added (MVA) and the level of related party transactions.

5. Research Methodology

5.1 Statistical Population

The target population in this study consist all the companies listed on Tehran Stock Exchange. Our purpose to choose the companies listed on the stock exchange is that it is relatively easier to access their financial information. Also, because of regulations and standards of Tehran Stock Exchange, these company's financial reporting information is more homogeneous.

5.2 Statistical Sample

In this study, all available data were used to select a sample. First, all companies that could participate in the sample, were selected, then from all existing companies, the companies that do not meet any of the following qualifications removed from this study and finally some of the companies were selected randomly:

* The selected company, should not be financial intermediaries, investment companies, holdings, and banks and leasing companies.

* Their fiscal year ends in 19 of March (29 of Esfand which is last month of Iranian year).

* The firms must be active and their stocks should have been traded in the TSE during the time period of the study (over1386-1392).

* The ratio of related party transactions do not represent more than 1% of a listed company's assets at the time they are concluded (The fifth paragraph is measured in comparison with the rest of the companies, so The ratio of related party transactions to the assets of all companies is measured, and finally the information is sorted out in Excel software and the companies which their transaction level with their related parties are greater than 1 percent of assets, are included in our study).

Considering above mentioned conditions, 468 firms were selected as our available population sample that if sample size estimation formula is used:

$$n = \frac{NZ^2_{\alpha/2}P(1-P)}{\varepsilon^2(N-1) + Z^2_{\alpha/2}P(1-P)}$$

N: population size;

p: success that is considered 95%;

Z: normal distribution standard variable.

$$n = \frac{468 * (1.64)^2 .95 * .05}{(.05)^2(468-1) + 1.64 * .95 * .05} = 49$$

ε: percentage error that is considered 10 percent.

The minimum sample size is 49, but for a better data analysis the most of those companies that their information were accessible were selected, So the research population included 85 companies (Azar & Momeni, 1392).

5.3 The Study Models

Multiple regression model is used to test the hypothesis:

$$RPT_{it} = \beta_0 + \beta_1 EVA_{it} + \beta_2 REVA_{it} + \beta_3 MVA_{it} + \beta_4\ Herfindahl_{it} + \beta_5\ Bargain\text{-}p_{it} + \beta_6\ Size_{it} + \beta_7\ Lev_{it} + \varepsilon_{it}$$

To prevent overlap also independent variables were used separately in the research model, and their impact on dependent variable was measured based on control variables.

Multiple regression model is used to test the hypothesis:

Model (1)

$$RPT_{it} = \beta_0 + \beta_1 EVA_{it} + \beta_2\ Herfindahl_{it} + \beta_3\ Bargain\text{-}p_{it} + \beta_4\ Size_{it} + \beta_5\ Lev_{it} + \varepsilon_{it}$$

Model (2)

$$RPTit = \beta 0 + \beta 1REVAit + \beta 2\ Herfindahlit + \beta 3\ Bargain\text{-}pit + \beta 4\ Sizeit + \beta 5\ Levit + \varepsilon it$$

Model (3)

$$RPT_{it} = \beta_0 + \beta_1 MVA_{it} + \beta_2\ Herfindahl_{it} + \beta_3\ Bargain\text{-}p_{it} + \beta_4\ Size_{it} + \beta_5\ Lev_{it} + \varepsilon_{it}$$

The following variables are used in this model:

1) The dependent variable

The level of related parties transactions (RPT) represents the logarithm of the total amount of related party transactions which were extracted from notes attached to the financial statements (Sheri, 1391).

2) Independent variables

$$EVA = NOPAT_t - (WACC \times CAPITAL_{t-1})$$

EVA: economic value added

MVA: market value added which is obtained through determining the difference between market value and book value of shareholders equity.

MAV= shareholders equity- (stock price) (the number of issued shares)

3) Control variables

Ownership concentration (Herfindahl): Is measured through Square% stakes held by three biggest shareholders.

Bargaining power (Bargain): Is obtained through dividing the sum of the second and third largest shareholders by the percent shares of the biggest shareholder.

Firm size (Size): Is obtained through the natural logarithm of firm total assets.

Financial leverage (Lev): Is obtained through dividing the firm total debt by its total assets.

6. Research Hypotheses Testing Results

6.1 Descriptive Statistics

Table 1. Descriptive statistics of the related companies

Standard deviation	Minimum	maximum	mean	median	Description
1.636117	0.000011	7.965000	4.967019	4.701194	The level of transactions with related parties (Natural logarithm of the transaction amount)
1.699419	7.021427	20.90230	18.70948	18.46118	Economic Value Added (Amount divided by total assets)
1.699059	6.914955	20.79050	18.60301	18.35397	Refined Economic Value Added (Amount divided by total assets)
1.343377	5.310380	20.70248	18.83119	18.75919	Market value added (MVA) (Amount divided by total assets)
3.242431	1.810005	72.72727	0.507692	0.755348	Ownership concentration (natural logarithm of Square% stakes held by three biggest shareholders)
0.253491	0.025600	1.000000	0.547600	0.540360	balance rights (dividing the sum of the second and third largest shareholders by the percent shares of the biggest shareholder by total assets)
0.217322	0.096415	2.729280	0.554653	0.557564	Firm size (Natural logarithm of the amount of sale)
0.658222	10.29121	14.17223	11.75326	11.81687	Firm financial leverage

Table 1 indicates the descriptive statistics including mean, standard deviation, variance, maximum and minimum for all variables in this study. The level of firm related party transactions mean is 4.96 percent. However, the standard deviation is 63.1 percent. In the first stage this shows that there is a lot of differences between companies in the level of related party transactions since the companies are different naturally which make them to consider different policies towards the related party transactions.

The correlation coefficient: Table 2 Results of Pearson correlation coefficients for all companies show that the coefficient is recorded on top of each cell and its probability it is inserted below it.

Table 2. Pearson correlation between variables (using all data)

Firm size	Firm financial leverage	Ownership structure	Control rights	Market value added	Refined economic value added	Economic Value Added	The level of transactions with related parties	Description
							2.672	The level of transactions with related parties
							-----	*
							-----	**
								Economic Value Added
						2.883	0.072	
						-----	0.612	*
						-----	0.001	**
					2.882	2.882	0.071	Refined economic value added
					-----	22218.520	0.607	*
					-----	0.000	0.004	**
				1.801	0.041	0.042	-0.023	Market value added
				-----	0.428	0.433	-0.250	*
				-----	0.009	0.005	0.003	**
			10.495	0.191	0.108	0.108	-0.018	Control rights
			-----	1.040	0.463	0.463	-0.079	*
			-----	0.009	0.004	0.003	0.007	**
		0.064	-0.129	-0.004	0.040	0.040	0.011	Ownership concentration
		-----	-3.771	-0.302	2.194	2.194	0.655	*
		-----	0.000	0.003	0.009	0.001	0.003	**
	0.047	0.000	-0.001	-0.020	0.019	0.019	0.007	Firm financial leverage
	-----	0.062	-0.050	-1.607	1.242	1.240	0.497	*
	-----	0.001	0.000	0.009	0.005	0.006	0.010	**
0.432	0.000	0.002	-0.001	0.038	0.073	0.073	0.527	Firm size
-----	-0.076	0.310	-0.016	1.029	1.555	1.559	13.293	*
-----	0.009	0.007	0.007	0.004	0.001	0.010	0.00	**

Table 2 shows the results of Pearson correlation analysis of the research variables. As presented in the table, the level of related party transactions has a significant impact on economic value added, refined economic value added and market value added. The positive relationship of firm size suggests that when the firm size is bigger, the possibility of the related party transactions will be increased. Control rights can also increase the effect of related party transactions since when the percent of the second and third biggest shareholders shares is more in relation to the biggest shareholder, the probability of related party transactions is increased. On the other hand the natural logarithm of assets (firm size) has a direct and significant relationship with most financial variables in this research, and its reverse relationship with financial leverage which indicates the nonlinear behavior of these two variables, because, as previously stated in the descriptive statistics, heterogeneous of assets causes their different behaviors.

6.2 Testing Models and Research Hypotheses

First hypothesis: there is a significant relationship between the economic value added (EVA) and the level of related party transactions.

Table 3. Panel model coefficients with fixed effects between the economic value added (EVA) and the level of related party transactions

P value	statistical test	coefficients	variables
0.00085	-1.69485	-0.06667	Economic Value Added
0.93510	0.08143	0.00160	Ownership concentration
0.39880	0.84455	0.21321	Control rights
0.00000	11.87595	1.17476	size
0.00070	0.04928	0.01444	Financial leverage
0.00000	-6.11093	-8.07268	Constant coefficient
2/47	Durbin–Watson statistic	40 percent	Coefficient of Determination

6.2.1 First Model Testing Results Analysis

In this hypothesis, the relationship between economic value added (EVA) and the level of related party transactions is discussed. First, the above regression model was fitted to all 596 firms -observations, but after removing extreme values, 562 observations- firms remain for testing the first hypothesis, which results of fittings of this model are as follows: To review the adequacy of the model the testing shows that F statistical value is equal to 1.508701 which is significantly lower than 0.005, so the adequacy of the model is confirmed at a confidence level of 95%. As a result, it is accepted that generally this model has the power to determine (a part of the) overall variations of dependent variable based on independent variables.

The coefficient of determination: R^2 statistical value shows that the model variables as a whole can explain 40 percent variations in the dependent variable. Also its test statistical value is less than 5 percent and the results of this hypotheses confirm a significant relationship between economic value added and related parties transactions. Also this hypotheses implies that when the level of firm economic profit rises, the managers are more inclined to transact with the related parties. Since based on agency theory, there is a separation of interests between shareholders and managers, the growth of economic value added increases the probability of related party transactions. The results of performance evaluation in this study are also inconsistent with Talebnia and shoja research (1390) on the relationship between the market value added ratio to the accounting earnings and economic value added ratio to accounting earnings, since they find a weak and insignificant relationship between these economic performance variables and accounting earnings.

The second hypothesis: there is a significant relationship between the refined economic value added (REVA) and the level of related party transactions.

Table 4. Panel model coefficients with fixed effects between the refined economic value added (EVA) and the level of related party transactions

P value	Statistical test	coefficients	variables
0.00085	-1.69485	-0.06667	refined economic value added
0.93510	0.08143	0.00160	Ownership Ratio (control rights)
0.39880	0.84455	0.21321	Control rights
0.00000	11.87595	1.17476	size
0.00070	0.04928	0.01444	Financial leverage
0.00000	4.632315	5.025611	Constant coefficient
2/47	Durbin–Watson statistic	40 percent	Coefficient of determination

6.2.2 Second Model Testing Results Analysis

In this hypothesis, the relationship between refined economic value added (REVA) and the level of related party transactions is discussed. First, the above regression model was fitted to all 596 firms -observations, but after removing extreme values, 562 observations- firms remain for testing the second hypothesis, which results of fittings of this model are as follows: To review the adequacy of the model the testing shows that F statistical value is equal to 1.508682 which is significantly lower than 0.005, so the adequacy of the model is confirmed at a confidence level of 95%. As a result, it is accepted that generally this model has the power to determine (a part of the) overall variations of dependent variable based on independent variables.

The coefficient of determination: R^2 statistical value shows that the model variables as a whole can explain 40 percent variations in the dependent variable. Also its test statistical value is less than 5 percent and the results of this hypotheses confirm a significant relationship between refined economic value added and related party transactions.Also this hypotheses implies that when the level of firm economic profit rises, the managers are more inclined to transact with the related parties. Since based on agency theory, there is not any conflict of interest between shareholders and managers, and increasing refined economic value added also increases the probability of related party transactions. In other words increasing shareholders equity value (market value of shares) attract more investors especially the related parties to invest in these companies. The results of performance evaluation in this study are also inconsistent with Khodadadi and Tucker (1390) research that examines the impact of corporate governance features including ownership concentration, institutional investors, state ownership, managerial ownership, Separate roles for the Chairman and CEO and the percentage of outside directors on the board on firm's financial performance and value . because the results of their research show that by increasing the ratio of ownership (control rights), the level of related party transactions decreases.

The third hypothesis: there is a significant relationship between the market value added (MVA) and the level of related party transactions.

Table 5. Panel model coefficients with fixed effects for market value added (MVA) and the level of related party transactions

p-value	Statistical test	coefficients	variables
0.342200	-0.950756	-0.046752	Market value added
0.997300	0.003331	0.000066	Ownership Ratio (control rights)
0.490100	0.690657	0.174116	Ownership concentration
0.000000	11.760440	1.162258	size
0.033800	-0.083151	-0.24443	Financial leverage
0.000000	-5.483797	-8.236527	Constant coefficient
2/48	Durbin–Watson statistic	39 percent	Coefficient of determination

6.2.3 Third Model Testing Results Analysis

In this hypothesis, the relationship between market value added (MVA) and the level of transactions with related parties is discussed. First, the above regression model was fitted to all 596 firms-observations, but after removing extreme values, 562 observations- firms remain for testing the third hypothesis, which results of fittings of this model are as follows: To review the adequacy of the model, the testing shows that F statistical value is equal to 1.471331 which is significantly lower than 0.005, so the adequacy of the model is confirmed at a confidence level of 95%. As a result, it is accepted that generally this model has the ability to determine (a part of the) overall variations of dependent variable based on independent variables.

The modified coefficient of determination: R^2 statistical value shows that the model variables as a whole can explain 39 percent variations in the dependent variable. In this test statistical value is more than 5 percent and the results of this hypotheses do not confirm a significant relationship between market value added and related parties transactions. Also this hypotheses implies that since market value added is a result of the difference between book value of equity and shares market value, this difference may be due to the management policies or market conditions that related parties are reluctant to invest or transact in a company due to information asymmetry relative to other investors. So this implies that there is not any significant relationship between market value added (MVA) and the level of transactions with related parties. Also the results of performance evaluation in this study do not necessarily conform with Talebnia and shoja (1390) and Moghaddam and Kazem pour (1391) researches which reviewed financial performance criteria significant relationship with the level of related parties transactions and financial returns.

7. Recommendations to the Users of the Research Results

1). Before offering the suggestions, potential users of the research results are recommended to use the results of this study by taking into account the limitations which are mentioned in the previous section.

2). According to the results regarding the impact of economic value added and refined economic value added on the transactions with investors and managers related parties, it is suggested that the investors and the managers pay more attention to the above mentioned performance criteria.

3. Since that the economic value added and refined economic value added are considered as influencing measures for the level of related party transactions, it is recommended that Tehran Stock Exchange take actions to provide economic value added and refined economic value added for the companies.

7.1 Suggestions for Future Research

1) To review the effect of corporate governance variables including CEO independence, board diversity, the presence of institutional shareholders on the boards and … on the level of related party transactions.

2) In this research, book value based variables are used to measure the study variables. Therefore, it is suggested that in the future researches market variables also be considered as study variables.

3) To review the effects of the cases as firms life cycle, information asymmetry, liquidity in equities, … on transaction levels with the related parties.

4) It is possible to conduct a study for periods before and after the implementations of the standards then to review the impact of standards on these ratios in the future.

5) To consider unlisted companies and to conduct similar research about them.

6) To review the relationship between ownership structure (concentration and composition) and the level of related party transactions by exploring shareholders' investment horizons (short-term and long-term).

7) The present research statistical population includes manufacturing companies listed in Tehran Stock Exchange, so the results may not be generalizable to non-listed and non-manufacturing industries. It is suggested that in the future studies their statistical population consist of all manufacturing and non-manufacturing firms, and also in the future studies the relationship between firms economic performance and the level of transactions with related parties in manufacturing and non-manufacturing firms will be determined.

7.2 Practical Suggestions

1). Due to the concentrated ownership structure of the business environment in Iran and the fact that firms are more likely to engage in opportunistic behavior in transactions with related parties, it is recommended that national regulatory bodies pay a lot of attention to the subject of related party transactions

2). In this study indirect abuse in related party transactions by observing these transactions linkage with some market variables and firm strategies are studied. So in order to achieve a better results the related party transactions must be considered as an endogenous variable . It is better to assume that shareholders can always decide freely to chooserelated party transaction or not.

8. Research Limitations

1). This study like all other descriptive studies have limitations of time and space and its time period covers 7 years from 1386 till 1392 and its sample includes listed companies in Tehran Stock Exchange. Thus caution is needed when generalizing the findings of this study to other times and other statistical populations.

2). Probable impact of differences in accounting methods (such as depreciation calculation method) on the contained items in the financial statements of companies may affect the results of the study and an adjustment has not been made in this regard.

3). Due to the limitations of the statistical population, these limitations should be acknowledged when generalizing the findings of this study to other companies.

4). Accounting researches are often post- event researches so it is not possible to observe the variables directly. Although it should be mentioned that in no research even experimental scientific researches an exact control of the variables is not possible.

5). The political, economical and cultural conditions in Iran and psychological atmosphere prevailing in Tehran Stock Exchange and the awareness level of people participating in the capital market impress supply and demand, the volume of trading and market growth and recession.

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Economic Effects of Tax Evasion on Jordanian Economy

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Abstract

This study aims to clarify the economic effects of tax evasion especially on the Jordanian economy. The researchers has depended on the literature to highlight the negative effects of tax evasion on the economy of states. And by analyzing some statistics published by the Economic and Social council of Jordan, the results showed the tax evasion in Jordan forms a real problem because it amounted a high rate of revenue. Therefore the government should treat the evaders by more rigor.

Keywords: tax evasion, taxpayers, economic effects

1. Introduction

The tax is considered one of the financial policy of the state tools, also it considered as one of the most important tributaries of the public treasury to local revenues. The states always seek to achieve many goals by applying the tax system. These goals can be either financial or social goals, or economic goals. The financial goal is one of the significant goals of the tax system, where taxes increase revenues of state treasury from internal sources. While the social goals of tax could be seen as the social responsibility of the government as a big organization. This is because tax is working to present concentration of wealth in the hands of a limited number of members of the community, also it has a role in shaping the policy of birth control in countries, such as China and India, or in encouraging the birth control policy as in Scandinavian Countries. Moreover, tax contributes to reduction of housing crisis by exempting materials used in the housing sector (Fleurbaey et al., 2006). The economic goals of tax are as follows:

1) Encouraging specific productive activities through tax exemption in whole or in part, where this method is used to encourage industrial and tourism investment in many countries.

2) Reduction of Economic recession, where economic recession leads to lower purchases and accumulation of products, the role of the states in such cases is to increase purchasing power of individuals through lowering tax rates and increase tax exemptions.

3) Reduce the phenomenon of concentration of economic projects by taxing the merged projects.

4) Encourage investment and savings through the exemption the returns of treasury bonds from tax in order to encourage their purchase (Leigh, 2010). This study provides the evidence of the negative effects of tax evasion on the national economy.

2. Problem Statement and Questions

Based on the rules calling for the imposition of the tax, which were set by Adam Smith in the book “The Wealth Of Nations” in the late eighteenth century (Blundell, 2006). Tax evasion becomes the stumbling block preventing the collection of taxes and spending in accordance with the tax rules, led by the Justice and Equality rule. Therefore, the problem of this study takes the following statement.

Tax Evasion is an unethical common practice, which leads to prevent governments from the implementation of vital projects, besides harming the taxpayers for the benefits of evaders.

3. This Problem Was Discussed according to the Following Questions

1) What are the reasons for tax evasion?

2) How much is the size of tax evasion in Jordan?

3) What are the most effective tools to reduce tax evasion?

4. The Study Objectives

This study aims to achieve the following objectives:

- Determining the volume of tax evasion in Jordan.
- Exploring the causes and the used tools in tax evasion.
- Identifying the economic effects of tax evasion.

5. The Study Importance

Income tax represents the contribution of individuals and firms in the development of the country in which they live and work in it to gain several benefits such as; income, peace and security, education, healthcare, and etc.

Where the tax system imposes the deduction of a reasonable percentage from the earned income by individuals and firms to fund the services mentioned above, where a large percent of the community members benefit from these services. The importance of this study stems from this logic which requires a shared contribution to activate such governmental services which will lose their effectiveness in the case of funding shortage represented by the tax evasion.

6. Methodology

The descriptive approach was used in conducting this study through reviewing the related literature to shed light on the economic effects of tax evasion. In the next stage, the researchers has analyzed the published statistics issued by the Jordanian economic and social council, for the years 2010-2015 to identify the tax evasion volume and its negative impacts on Jordanian economy.

7. Literature Review

There are a lot of studies and researches that address the tax theme from different aspects in the literature, but because the purpose of this study is to explore the economic effects of tax evasion, the researchers has chosen the following studies:

Study by Lin and Yang (2001). Under the title: “A Dynamic Portfolio Choice Model of Tax Evasion: Comparative Statics of Tax Rates and its Implication for Economic Growth.”

This study aims to examine the effects of shifting from static model to dynamic model in tax evasion. The study was conducted through computation of the size of tax evasion according to the two models. The main results of the study showed that higher tax rates reduce tax evasion in the static model, while they encourage tax evasion in the dynamic model.

Study by Alm (2012). Under the title: “Measuring, Exploring, and Controlling tax Evasion: Lessons from Theory, Experiment, and Field Studies.”

The study aimed to evaluate the public understanding about tax evasion since what was stated by Allingham and Agnar Sandmo, who were launched the modern analysis of tax evasion in 1972. The study was conducted on information on individual compliance for a random sample of 50000 individual from the “Taxpayer Compliance Measurement Program” in the U.S.A. the researcher focused on three questions and their answers to assess the understanding of tax evasion. First, how do we measure the extent of tax evasion? Second, how can we explain these patterns of behavior? Third, how can we use these insights to control evasion?. The main results showed that the people who are interested have learned many things in the last 40 years, but there are still many gaps in their understanding, such as; how much evasion really occurs on the national and local levels? Do higher tax rates encourage/discourage Compliance? What is the audit role in tax evasion? Then the researchers recommended to develop the tax theory because one theory may not fit all individuals at all times.

Study by Agnar Sandmo (2004). Under the title: “The Theory of Tax Evasion: A Retrospective View.”

This study aimed to shed light on some themes in the theory of tax evasion through examining the related studies starting from Allingham and Sandom 1972. The analysis of comparative statistics, were placed in the study as a measure of tax evasion in the original model of individual behavior, where the tax evasion decision is similar to portfolio choice.

The results showed that tax evasion is not an over whelming problem, and the marginal tax rate should be governed by effective measures and equity concerns. Firms may also be from the evaders of income tax because it pertains to human behavior.

Study by Chen (2003). Under the title: “Tax Evasion in a model of endogenous growth.”

This study aimed to link tax evasion with the standard “AK” Growth model and the public capital In this model, the government optimizes the tax rates, while individuals optimize tax evasion. The study examined the effects of three government policies; tax rates, tax evasion, and economic growth. The results showed that the three policies have a quantitative effects on discouraging tax evasion, while their effects on economic growth are very limited.

8. Theoretical Background

Tax evasion can be defined as an denial of the individual tax due to be paid either by provision of inaccurate or deceptive financial statements for tax departments or any other means legal or illegal to get rid of tax payment (Munther, 2006). Other researchers have defined tax evasion (Mousa, 2010), pointed out that tax evasion is an attempt by the tax payer to get rid of tax payment partially or completely, without being reflected as a burden on others.

Tax evasion has negative effects on the economy Rami, (2014); Cobham (2005) has argued that tax avoidance and tax evasion affect negatively on development funding which may lead the country to borrowing and bearing a high cost. Other researchers, for example (Slemrod, 2007) pointed out that tax evasion produces a tax gap that means how much tax should be paid, but is not paid voluntarily in a timely way. From here one can summarize the effects of tax evasion on the economics of any state as follows:

Decline in government investment, and the lower the frequency of public spending due to lower volume of public revenues earned by the state from taxpayers. And this may lead to increase the rate of poverty and unemployment from the point of view of the current researcher.

Because of the tax gap that resulted from tax evasion, the current researcher believes that such action overwhelms abiding citizens.

Expanding of tax evasion leads to internal and external borrowing to cover the shortage in the public revenue, and this means that the state became under the pressure of interest payments (Gorodnichenko et al., 2007).

With tax evasion, the base of tax justice will not be achieved due to non-payment of tax by evaders.

The tax evasion effects the moral side because it means corruption and lack for honesty that may inherit successive generations.

In order to illustrate why some tax payers used to practice the tax evasion, the researcher believes that the reasons of this wrong practice may be the tax regulations or the high tax rates or the weakness of tax awareness. For Jordan, the main cases of tax evasion are the following (Economic and Social Council, 2014):

Complexity and non-stability of the tax law in Jordan in terms of many of modifications, which leads to misunderstanding to the tax law.

Complacency in the imposition of sanctions on evaders.

The lack for data base about the activities of many of taxpayers such as; doctors, engineers, and advocators and others.

The lack for qualified employees in tax departments such as auditors, accountants.

Weak control procedures.

Accordingly, Table 1 below shows the estimated volume of tax evasion in Jordan for the years 2010-2015.

Table 1. Tax evasion (million JD)

	Actual		Estimated			
	2010	2011	2012	2013	2014	2015
Tax Revenue	2544.9	2569.8	2594.9	2698.7	2806.7	2919.0
Non-tax revenues	1885.6	1715.4	1766.9	1819.9	1910.9	2006.4
Social Security	648.7	767.9	909.0	1076.0	1273.8	1507.8
Total	5074.2	5053.1	5277.8	5594.6	5991.3	6433.2
Gross Domestic Product	1876.2	2047.7	2196.6	2416.0	2600.0	2790.4
The tax burden	27.1%	24.7%	24%	23.2%	23%	23.1%
The Size of informal economy as a percentage of GDP	22.1%	21.1%	21.4%	22.1%	23.2%	24.5%
The size of informal economy	4646.4	4325.5	4694.4	5337.1	6019.8	6845.5
Tax evasion volume	1122.5	1067.4	1126.4	1235.9	1387.2	1578.2

Source: Economic and Social Council, 2014.

Tabular analysis for the figures above.

Percentage of tax revenue to total revenue.

Table 2. Actual figures

2010:	$\frac{2544.9}{5074.2}$	× 100 = 50.2%
2011:	$\frac{2569.8}{5053.1}$	× 100 = 50.8%

This means that tax revenue forms the greater proportion of revenue, so, it is very important for the government treasury.

Table 3. Estimated figures

2012:	$\frac{2394.9}{5277.8}$	× 100 = 45.4%
2013:	$\frac{2698.7}{5594.6}$	× 100 = 48.2%
2014:	$\frac{2806.7}{5991.3}$	× 100 = 46.8%
2015:	$\frac{2919.0}{6433.2}$	× 100 = 45.4%

The ratios above show that tax revenue still high, but not exceed half revenue as happened in the actual period.

For the tax evasion, the percentage of tax evasion to total revenue amounted to 22% and 21% for the years 2010, 2011 respectively. While, for the estimated period these ratios, were 21% 22%, 23% and 25% for the years 2012-2015 respectively. And stability of these ratios may due to the absence of government sanctions to combat tax evasion.

9. Results and Recommendations

9.1 Rsults

The main results of this study are:

- Tax evasion is unethical practice whether by individuals or firms.
- Tax evasion has negative impact on the economy in terms of reducing the government investments and financing vital projects.
- Reducing government investments leads to increase of unemployment rates.
- Tax evasion may push the state to rely on borrowing internally and externally, which put the state under new obligations of interest.

9.2 Recommendations

- Tax law in Jordan should be stable to achieve good understanding by taxpayers.
- The government should impose serious sanctions on evaders.
- The tax department should pay more attention to the human capital in terms of qualifications and experience, and moral courage.

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