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Creditor Nations' Equity Indexes and the U.S. Debt Downgrade

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Abstract

On Friday, August 5, 2011 Standard and Poor's rating agency downgraded long-term U.S. Treasury debt from AAA to AA+ for the first time in history. In this study, the impact of this downgrade on world stock markets is examined. We analyze the immediate effect of this downgrade on leading stock indices of 31 nations owning U.S. Treasury debt. We find that the downgrade had a marked effect on the first trading day following the announcement. It truly was a macroeconomic event. We further examine whether return differentials were partially explained by the level of U.S. debt that each country possessed (both on an absolute and relative basis). We find no evidence of this relationship, which suggests equity markets in countries owning considerable Treasury securities suffered no more or less than equity markets in countries with less U.S. Treasury debt.

Keywords: economic integration, information and market efficiency, event studies

1. Introduction

When the U.S. equity markets closed on Friday, August 5, 2011 Standard and Poor's (S&P) rating agency downgraded the credit rating of long term U.S. Treasury securities from AAA to AA+. The rating agency (Note 1) included the following phrases in its downgrade announcement "On political risks and raising debt burden" and "Outlook Negative". This downgrade and its impact were discussed widely in the popular press in the days following the announcement. For example, in an article in The Guardian (U.K.), Elliott, Treanor and Rushe (2011) mention (Note 2):

"The United States lost its AAA credit rating late on Friday night, ending another wild day on the world stock markets and prompting fears that next week could be equally as calamitous."

and

"This is the first time that S&P has issued a "negative" outlook to the U.S. government since it began rating the credit-worthiness of railroad bonds in 1860. The dramatic reversal of fortune for the world's largest economy means that U.S. Treasuries, once seen as the safest investment in the world, are now rated lower than bonds issued by countries such as U.K., Germany or France. The move is likely to raise the borrowing costs for the American government, companies and consumers."

In another article published on August 8, 2011, Meinero states:

"European stocks closed sharply lower Monday, as action to bolster faltering Eurozone nations couldn't overcome concerns about Standard and Poor's downgrade of U.S. debt. Asian markets also finished lower." (Note 3)

Numerous other newspaper headlines and finance blogs referred to the downgrade and its impact on world stock markets. The issue was prominently debated all weekend and speculation on the depth of the stock market decline when markets opened on Monday was wide.

There are two main purposes of this paper. First, we examine the stock market returns of the leading market indices of 31 nations holding U.S. Treasury debt just prior to the downgrade. Second, we test whether stock returns in countries with large holdings of U.S. Treasury debt were more severely affected than countries with smaller holdings. While we find that the markets reacted negatively to the rating change, there appears to be no relationship between the level of Treasury debt held and the return on a country's stock market. Our results are robust in that we consider Treasury holdings both as on an absolute basis and a relative basis (as a percentage of GDP). Thus, we

conclude that while there was a negative reaction to the downgrade in all stock markets, it was not impacted by the size of a country's Treasury holdings.

A few studies in the past ten years have looked at the impact of changes in sovereign credit ratings on stock markets. Brooks, Faff, Hillier and Hillier (2004) were among the first to look at aggregate stock market returns surrounding sovereign credit rating changes. Their sample includes rating changes over the period 1973-2000. With regard to rating downgrades, they find that the event day impact is significantly negative. While the Brooks et. al. (2004) study concentrated on market returns in countries that were re-rated, Ferreira and Gama (2007) study the impact of cross-country stock market reactions to S&P's announcements of sovereign credit rating or credit outlook changes. They show that debt rating and credit outlook changes for one sovereign have an asymmetric and economically significant effect on stock markets of other countries over the period 1989-2003. An interesting study by Hooper, Hume and Kim (2008) finds that rating downgrades significantly decreased dollar denominated stock market returns and increased volatility. They also analyze upgrades and find that the results are the opposite in a data set of 42 countries covering the major regions of the world over the period 1995-2003. Pukthuanthong-Le, Elayan and Rose (2007) examine the changes in sovereign credit ratings on bonds and stocks over the 1990-2000 period. They show that stock market responses for downgrade are more pronounced under certain conditions.

Our research investigates the impact of just one such downgrade in sovereign credit ratings, the S&P rating change of long-term U.S. Treasury debt. We focus on the impact this downgrade had on stock markets in 31 countries that hold several billion dollars of their taxpayers' money in U.S. Treasury debt. Our research differs from prior studies in several ways. First, we examine the impact on equity markets around the world of a single rating downgrade, specifically the rating downgrade of the wealthiest country and the largest economy in the world. Since this is the first time U.S. Treasuries have been downgraded and considering that other sovereign credit ratings changes impacted stock markets, one logically expects the U.S. downgrade to have a significant impact on equity markets.

Finance textbooks and professionals across the globe routinely use the U.S. Treasury rate as the risk-free rate. A rating downgrade for the U.S. was previously unheard of and therefore is likely to reverberate throughout the world since U.S. Treasury rates technically are not risk-free. As mentioned by Elliott, Treanor and Rushe (2011) in the popular press, other countries such as the U.K., France and Germany all have a superior credit rating to the U.S. The force of this landmark financial event is likely to affect markets throughout the world. This is a classic example of a systematic event, one which virtually no asset is immune. Alternatively, many people have little faith in the rating agencies following their less than stellar performance in the time leading up to the financial crisis, which began in 2008. One may also argue that the information is not new information. The other major rating agencies did not downgrade U.S. debt.

A second way our study differs is that virtually every major economy in the world has invested heavily in U.S. Treasury securities, and we factor this level of investment into our analysis. Led by Mainland China, whose investment in Treasury securities exceeded $1 trillion as of July 2011, several of the leading nations in the world have invested a great deal in U.S. debt. The complete list of countries is given in Table 1. We surmise that countries having large investments in U.S. Treasuries may see a more pronounced impact from the downgrade. A downgrade generally leads to a reduction in the market price of the asset. Thus, one would expect Treasuries to be worth less following the downgrade. A decrease in the value of Treasuries means larger future taxes for citizens and corporations in the long run should the investor governments decide to sell some or all of these securities in the market. Considering that several countries have invested in excess $100 billion in Treasuries, we also investigate whether the holding size is related to the magnitude of the stock market return.

The remainder of the paper is organized as follows: In section two, we present the data used in the study and develop our hypothesis. We present the empirical evidence in the third section and conclude in the last section.

2. Data

We gathered data from several sources: First, we obtained the data for the list of countries owning U.S. Treasuries from Treasury's website (Note 4). A table entitled "Major Foreign holders of Treasury Securities" lists 31 nations and also includes other major investors like "Oil Exporters" and "Caribbean Banking Centers." Both are excluded from the study because they have no associated stock index. We use data as of July 2011, which closely matches the event period. We also select a leading stock market index for each country. Table 1 lists the countries, the leading equity index, the index's Bloomberg ticker symbol and the dollar value of Treasury holdings.

The daily closing values for the stock indices and gross domestic product (GDP) figures are obtained from Bloomberg. GDP data is for the second quarter of 2011. These values are in U.S. dollars, which is consistent with the market value of Treasury holdings.

Table 1. U.S. Treasury Security Holdings by Country

Country	Equity Index	Bloomberg Ticker	Holdings (billions)
China, Mainland	CSI 300	SHSZ300	$1,173.5
Japan	NIKKEI 225	NKY	914.8
United Kingdom	FTSE 100	UKX	353.4
Brazil	Brazil Bovespa	IBOV	210.0
Taiwan	Taiwan TAIEX	TWSE	154.3
Switzerland	Swiss Market	SMI	108.4
Hong Kong	Hang Seng	HSI	111.9
Russia	MICEX	INDEXCF	100.7
Canada	S&P/TSX Composite	SPTSX	83.5
Luxembourg	LuxX	LUXXX	61.4
Germany	DAX	DAX	61.2
Singapore	FTSE Straits Times	FSSTI	63.0
Thailand	Thai SET 50	SET	65.2
Turkey	ISE National 100	XU100	41.9
India	BSE SENSEX 30	SENSEX	37.9
Ireland	Irish Overall	ISEQ	34.3
South Korea	KRX 100	KRX100	29.4
Belgium	BEL 20	BEL20	31.3
France	CAC 40	CAC	22.5
Poland	WSE WIG	WIG	29.3
Mexico	Mexico IPC	MEXBOL	29.1
Philippines	PSEi	PCOMP	25.1
Italy	FTSE MIB	FTSEMIB	24.3
Netherlands	AEX	AEX	23.2
Norway	OBX	OBX	17.6
Sweden	Stockholm 30	OMX	21.3
Colombia	Columbia COLCAP	COLCAP	20.0
Chile	Chile Stock Market Select	IPSA	18.0
Israel	Tel Aviv 25	TA-25	17.2
Malaysia	FTSE Bursa Malaysia	FBMKLCI	13.3
Australia	S&P/ASX 200	AS51	13.1

*Source: Department of the Treasury/Federal Reserve Board (Name of Country and Holdings) and Bloomberg
Website: http://www.treasury.gov/resource-center/data-chart-center/tic/Documents/mfh.txt

3. Empirical Evidence

3.1 Regression Analysis of Daily Returns

We first calculate the daily returns for each index shown in Table 1. The daily percentage returns are calculated for the period 5-31-2010 through 8-12-2011 using Equation 1.

$$R_t = [(CVI_t - CVI_{t-1}) / CVI_{t-1}] * 100 \quad (1)$$

In the above equation, r_t is the return on the index for day t, and CVI_t and CVI_{t-1} are the daily closing values of the index at the end of day t and the previous day, t-1. Thus, we end up with daily percentage returns for each of the 31 indices.

S&P's downgrade was announced after the U.S. markets closed on 8-5-2011. Regression Model A is employed to measure the impact of the announcement.

$$\text{Regression Model A: } R_t = \beta_0 + \beta_1 day_1 + \beta_2 day_{2\&3} + \beta_3 day_{4\&5} + \varepsilon \quad (2)$$

The daily percentage return is the dependent variable in the regression, and it covers a period of approximately 300 days. For some indices, the sample period is slightly above or below this level due to mismatch of holidays among countries. The return from the close on 8-5-2011 to 8-8-2011 is considered the day_1 return for all indices. This day reflects the first trading day post-announcement. We separate the post-announcement week into three binary variables: day_1 takes a value of one for 8-8-2011, zero otherwise. We want to separate the event day based on the result of Brooks, et. al. (2004), who find a significant negative impact for downgrades on event day. Also, this day is

likely to reflect market reaction more than a group of days since it covers the weekend when the downgrade was discussed widely in the popular press across the world. $day_{2\&3}$ represents a dummy variable assigned a value of one for the two days 8-9-2011 and 8-10-2011, zero otherwise. $day_{4\&5}$ is the third dummy variable and is set to one for the two trading days 8-11-2011 and 8-12-2011, and zero otherwise. The results of the 31 regressions are displayed in Table 2.

Table 2. Regression Model A

Country	Bloomberg Ticker	Constant (t-stat)	Day_1 (t-stat)	$Day_{2\&3}$ (t-stat)	$Day_{4\&5}$ (t-stat)	N	R^2	F-value
China	HSI	0.01 (0.16)	-3.80 (-49.39*)	0.43 (2.78*)	0.85 (5.92*)	294	0.04	0.015
Japan	NKY	-0.01 (-0.08)	-2.17 (-27.55*)	-0.31 (-0.77)	-0.41 (-4.18*)	298	0.01	0.482
UK	UKX	0.01 (0.13)	-3.40 (-52.94*)	-0.59 (-0.81)	3.07 (46.65*)	306	0.09	0.000
Brazil	IBOV	-0.05 (-0.75)	-8.03 (-115.55*)	2.84 (4.15*)	2.07 (3.94*)	301	0.18	0.000
Taiwan	TWSE	0.03 (0.42)	-3.85 (-62.23*)	1.20 (2.07*)	-0.67 (-4.67*)	302	0.06	0.000
Switzerland	SMI	-0.06 (-0.96)	-3.88 (-60.41*)	-1.70 (-2.43*)	4.76 (40.04*)	308	0.20	0.000
Hong Kong	HIS	0.03 (0.38)	-2.20 (-33.28*)	-1.68 (-1.46)	-0.44 (-2.64*)	301	0.03	0.030
Russia	INDEXCF	0.07 (0.94)	-5.56 (-78.77*)	-2.35 (-3.69*)	1.30 (5.19*)	301	0.09	0.000
Canada	SPTSX	0.01 (0.28)	-4.05 (-78.15*)	2.23 (4.99*)	1.39 (3.38*)	303	0.13	0.000
Luxembourg	LUXXX	-0.04 (-0.69)	-4.33 (-74.15*)	-1.61 (-4.20*)	1.76 (7.78*)	308	0.08	0.000
Germany	DAX	0.02 (0.28)	-5.04 (-70.81*)	-2.64 (-3.55*)	3.35 (45.65*)	311	0.15	0.000
Singapore	FSSTI	0.03 (0.64)	-3.73 (-76.28*)	-1.56 (-8.30*)	1.36 (7.88*)	306	0.11	0.000
Thailand	SET	0.13 (2.30*)	-1.52 (-25.95*)	-0.94 (-1.30)	1.09 (3.55*)	295	0.02	0.110
Turkey	XU100	0.02 (0.25)	-7.10 (-90.13*)	-1.88 (-2.02*)	1.84 (4.00*)	306	0.11	0.000
India	SENSEX	0.01 (0.19)	-1.84 (-27.45*)	0.41 (1.16)	-0.86 (-5.90*)	307	0.01	0.214
Ireland	ISEQ	-0.05 (-0.65)	-4.37 (-61.44*)	0.37 (0.48)	2.32 (11.97*)	307	0.06	0.000
S.Korea	KRX100	0.06 (0.99)	-3.68 (-58.72*)	-2.01 (-4.21*)	-0.71 (-2.50*)	303	0.06	0.000
Belgium	BEL20	-0.03 (-0.51)	-3.73 (-57.26*)	-0.03 (-0.03)	4.06 (9.44*)	313	0.12	0.000
France	CAC	-0.01 (-0.19)	-4.66 (-59.47*)	-1.90 (-1.82)	3.47 (19.47*)	313	0.10	0.000
Poland	WIG	0.01 (0.13)	-3.52 (-65.01*)	-3.99 (-38.91*)	3.34 (13.06*)	306	0.25	0.000
Mexico	MEXBOL	0.02 (0.40)	-5.90 (-117.33*)	0.78 (2.01*)	1.77 (2.45*)	307	0.16	0.000
Philippines	PCOMP	0.11 (1.75)	-2.50 (-40.71*)	-0.52 (-0.49)	0.26 (3.65*)	301	0.02	0.076
Italy	FTSEMIB	-0.06 (-0.60)	-2.29 (-25.09*)	-3.01 (-2.85*)	4.10 (44.02*)	311	0.08	0.000

Netherlands	AEX	-0.02 (-0.31)	-4.36 (-65.19*)	-1.03 (-1.48)	2.63 (14.06*)	313	0.10	0.000
Norway	OBX	0.03 (0.37)	-5.53 (-65.46*)	-0.16 (-0.42)	3.15 (19.40*)	307	0.09	0.000
Sweden	OMX	-0.00 (-0.07)	-4.82 (-69.03*)	0.19 (0.22)	2.90 (12.19*)	306	0.09	0.000
Colombia	COLCAP	0.04 (0.55)	-3.35 (-48.52*)	1.48 (3.93*)	0.87 (8.74*)	297	0.05	0.001
Chile	IPSA	0.02 (0.30)	-6.94 (-109.51*)	4.13 (8.22*)	1.75 (6.53*)	305	0.27	0.000
Israel	TA-25	0.03 (0.49)	-7.01 (-128.88*)	-0.68 (-1.08)	1.78 (6.32*)	298	0.17	0.000
Malaysia	FBMKLCI	0.06 (1.85)	-1.86 (-58.16*)	-0.60 (-1.87)	0.05 (0.42)	301	0.00	0.002
Australia	AS51	0.06 (1.85)	-1.86 (-58.16*)	-0.60 (-1.87)	0.05 (0.42)	301	0.05	0.002
Average of Estimates		n/a	-4.09%	-0.51%	1.68%			

*significant at 1% level.

Table 2 reports that the intercept is insignificant for all but one of the 31 regressions with the exception of Thailand's SET index. The intercept measures the average return when all binary variables are zero. Thus, over this period the average daily return was insignificantly different from zero in all cases but one. The day_1 variable is significantly negative at the 1% level for all indices, which indicates that in all cases the return on this day was at least several standard deviations below the average of the preceding period. Thus, there is little doubt that the downgrade announcement caused equity investors to reduce their value estimates for stocks around the world.

The results for the second dummy variable ($day_{2\&3}$) are conflicting. The coefficient estimate is significantly positive for China, Brazil, Taiwan, Mexico, Columbia and Chile. These markets all had strong stock market rebounds. In Switzerland, Russia, Canada, Luxembourg, Germany, Singapore, Turkey, South Korea, Poland and Italy, the coefficient estimate is significantly negative suggesting continuing strong downturns in stocks. The coefficients for the other countries were insignificantly different from the average daily return prior to the downgrade. The third dummy variable ($day_{4\&5}$) shows a pattern similar to the $day_{2\&3}$ dummy variable, although many more coefficient estimates are significant (24 are strongly positive and 3 are strongly negative). This is noteworthy because it appears that the market partially or fully recovered from the event. The last row in the table indicates that on average the markets in these countries fell by 4.09% on the first trading day post-announcement. Over the entire week, the average market downturn for the indexes was a more modest 2.91% on average.

A second plausible interpretation of the regression output is that on Monday, markets around the world reacted negatively to the downgrade. This was an unexpected, Titanic-like event that overwhelmed markets throughout the world. On Tuesday and Wednesday, stock markets moved with much less coordination. Non-systematic events caused some markets to be up, while others were down. Thursday and Friday was much like Tuesday and Wednesday.

In the next subsection, we analyze the negative returns on day_1 for affected nations.

3.2 Analysis of Day_1 Negative Returns

Ferreira and Gama (2007) study whether the news of sovereign debt ratings in one country impact stock markets in other countries. They configure a large set of countries that experienced sovereign debt upgrades and/or downgrades. In total they have 18 emerging markets and 11 developed ones. Our study differs as it examines the influence a single debt downgrade on the world's largest government has on stock markets. U.S. Treasury debt is unique in that a significant portion of it is held by other nations. In absolute terms, the U.S. debt held by other countries is extremely significant. This in itself lends credibility to the U.S. Treasury debt. This also appears as a vote of confidence for the U.S. by foreign governments. This debt has been rated AAA since ratings began and while the U.S. Treasury debt had been placed on "*Creditwatch"* earlier by rating agencies like Moody's (Note 5) it has never relinquished its AAA rating prior to 8-5-2011. There was a default by the U.S. Treasury, a technical one in 1979 (Zivney and Marcus, 1989). Evidence of default risk premiums on short-term and long-term U.S. Treasury securities was documented by Nippani, Liu and Schulman (2001) and Nippani and Smith (2010). However, none of these impacted the creditworthiness of the Treasury debt of the U.S. in the eyes of the rating agencies until recently.

We examine the possible relation between market downturns on day_1 and the amount of U.S. Treasury debt owned by sovereigns. Since the day_1 return was significantly negative in all 31 countries, we use the return for day_1 as the dependent variable in the following two regressions:

$$Regression\ Model\ B:\ day_{1x} = \beta_0 + \beta_1(Treasury_x) + \varepsilon \quad (3)$$

$$Regression\ Model\ C:\ day_{1x} = \beta_0 + \beta_1(Treasury_x / GDP_x) + \varepsilon \quad (4)$$

Regression Model B examines whether the negative return on day_1 can be partially explained by the level of Treasury debt held by country x ($Treasury_X$). For example, Mainland China owned over $1,173.5 billion of U.S. debt at the end of July 2011. This is much more than the $13.1 billion owned by Australia. A negative relationship between the level of Treasury debt held and a country's stock market performance is hypothesized.

Regression Model C examines whether the day_1 return can be partially explained by U.S. Treasury holdings scaled by country x's GDP ($Treasury_X/GDP_X$). Again, a negative relationship is anticipated. Hypothetically, equity investors may be more concerned with the economies of countries that have the equivalent of 20% of GDP invested in U.S. Treasuries versus ones that have 2% of GDP invested in Treasuries. The results of these two regressions are shown in Table 3.

Table 3. Regression Results

	Independent Variable	Constant (t-stat)	Coef. Estimate (t-stat)	N	R-Squared	F-value
Regression B	Treasury	-4.18	0.00	31	0.02	0.502
		(-18.99*)	(1.34)			
Regression C	Treasury/GDP	-4.19	0.01	31	0.01	0.604
		(-13.68*)	(0.73)			

*significant at 1% level.

For Regression B, the coefficient of Treasury holdings is insignificant and therefore it appears that the absolute amount of Treasury securities has no meaningful influence on the magnitude of the day_1 return. This is also the case for Regression Model C. The results provide no evidence that the amount of U.S. Treasury holdings scaled by GDP, explains none of the variation in returns. We look at the implications of these findings and conclude in the next section.

4. Conclusions and Implications

In this study we investigated the impact of the recent downgrade of U.S. Treasury debt on the leading stock market indices in 31 countries that own U.S. Treasury debt. We find that the stock indices of all these countries had sizable negative returns on the first trading day subsequent to the downgrade. While the negativity was not continuously apparent in trading days +2 to +5, some markets recouped some of the losses more quickly and had significant positive returns. We examine the hypothesis that the amount of U.S. Treasury holdings a nation has impacts the magnitude of returns on its leading stock index. We find no evidence to support such a hypothesis, even when dividing Treasury holdings by the country's GDP. Thus we conclude that while the stock markets reacted negatively to the S&P downgrade of long term Treasuries, the negative returns did not continue to drift downward. There is also no apparent penalty to equity markets associated with countries with large Treasury holdings measured on either an absolute or relative basis.

Kotlikoff (2006) asked the question a few years ago as to whether the United States was already bankrupt. Thakor (2006) who discussed the work of Kotlikoff (2006) disagrees, but cautions against excessive borrowing by the U.S. Treasury. Zivney and Marcus (1989) examined the impact of a temporary, technical default by the U.S. government and showed that yields increased following the default. Nippani, Liu and Schulman (2001) showed that under some circumstances, risk premiums were charged on short-term U.S. Treasury obligations, and Nippani and Smith (2010) showed the same for long-term U.S. Treasury debt. In another study, Liu, Shao and Yeager (2009) examine whether the financial markets charged a default risk premium on U.S. Treasury securities when the Federal government repeatedly reached their debt limits between 2002 and 2006. They find that a small risk premium was charged the first two times and no premium was charged in the last two recurrences. All this de facto evidence shows that the U.S. Treasury's securities were assessed a default risk premium during the time they were considered default-risk

free by rating agencies. Now, one agency gave de jure status to this scenario, which according to its own report was pessimistic about the capacity of Congress and the administration to be able to leverage their agreement into a broader fiscal consolidation plan.

Our study has significant implications for participants in the stock and bond markets. It is also of interest to academics and practitioners alike. First, we showed that the stock markets around the world reacted very negatively to the ratings downgrade of long-term U.S. Treasury securities. We also demonstrated that the return magnitude is not impacted by the amount of a country's Treasury holdings. The fact that the amount of U.S. Treasury debt held was not useful in explaining the return variation is not surprising considering that U.S. Treasury prices actually rose following the announcement. It appears that while equity investors reacted adversely to the downgrade, there is no evidence this downgrade will ultimately lead to default. For academics, this study is of interest in that it shows how the market reacts to the increased riskiness of a rate considered by several generations to be risk-free. Market makers may increasingly look for an alternate rate or perhaps a combination of rates to proxy for the risk-free rate of return. Future studies perhaps will focus on other impacts of this downgrade, especially on international bond markets.

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Notes

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The Risk-return Trade-off in Emerging Stock Markets: Evidence from Saudi Arabia and Egypt

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Abstract

This paper examines empirically the trade-off between risk (conditional volatility) and expected returns for the Saudi Arabian and Egyptian stock indices over the period of January 1, 2007 to December 30, 2011. The empirical analysis of the paper is carried out by means of the generalized autoregressive conditional heteroscedastic (GARCH) in mean methodology including both symmetric (GARCH-M) and asymmetric (EGARCH-M) models. The results show that the dynamic risk-return relationship is quite different between Saudi Arabian and Egyptian stock markets. A negative but insignificant relationship between expected returns and conditional volatility is found for daily returns in Egypt. In contrast, the conditional mean of the stock returns is positively but insignificantly related to its conditional variance in Saudi stock market a result which is consistent with the theory of a positive risk premium on stock indices which states that higher returns are expected for assets with higher level of risk. The findings of the paper are useful for financial decision making.

Keywords: expected returns, conditional volatility, trade-off, GARCH-in-mean model

1. Introduction

The relationship between stock market returns and their own conditional volatility (as a proxy for risk) (Note 1) has been extensively investigated in empirical finance literature during the last few years. A clear understanding of this relationship can be considered as one of the most important variables for investors as well as policy makers as it affects expected rates of return on every existing asset investment, for example it can help individual investors to make some predictions about the future and therefore, affects their investment decision making. It can also be regarded as an essential part for many financial applications and key components for example to mean-variance portfolio theory and for different asset pricing models.

In Econometrics practice, it is a well known fact that financial market volatility is not directly observable and that financial returns volatility exhibits certain characteristics that are specific to financial time series such as volatility clustering (Note 2) and leverage effect (Note 3) (Bollerslev, 1986). To estimate and therefore, capture these characteristics, financial econometricians have developed a variety of time-varying volatility models, among them, the autoregressive conditional heteroscedastic (Note 4) (ARCH) model proposed by Engle (1982) and its extension; generalized autoregressive conditional heteroscedastic (GARCH) model developed independently by Bollerslev (1986), and Taylor (1986) are well-known and frequently applied models. This development of econometric techniques leads financial economists and practitioners to rethink on traditional econometric methods (such as ordinary least squares, OLS) and also leads to creation of new versions of ARCH/GARCH framework such as GARCH-in-mean model (GARCH-M), Exponential GARCH-in-mean model (EGARCH-M), Threshold GARCH-in-mean model (TGARCH-M) and Power-in-mean GARCH model (PGARCH-M). These models can be used effectively to model and investigate the risk-return trade-off in financial markets, see for example (Bali and Peng, 2006; French et al., 1987; Ghyselsa et al., 2005; Glosten et al., 1993; Guo & Whitelaw, 2006; and Harrison & Zhang, 1999)

In Finance theory, it is generally accepted that the expected return of the market is positively and proportionally related to the conditional volatility meaning that if there are expectations of higher levels of risk associated with a particular investment then greater returns are required as compensation for that higher expected risk (Note5). Alternatively, if an investment has relatively lower levels of expected risk then investors are satisfied with relatively lower returns (Note 6). For example, the intertemporal capital asset pricing model (ICAPM) of Merton (1973) predicts a positive times series relation between the conditional mean and variance of market returns (Note 7). However, the

existing empirical evidence on the time series risk and return has drawn conflicting conclusions. For example Bansal and Lundblad (2002), Campbell and Hentschel (1992), Chou (1988), and French et al. (1987), Ghysels et al. (2005) and Ludvigson and Ng (2007) find the expected return positively related to its conditional variance. On the other hand, Bekaert and Wu (2000), Breen et al. (1989), Campbell (1987), Fama and Schwert (1977), Glosten et al. (1993), and Nelson (1991) all report a negative relationship between expected returns and conditional volatility.

More recently the issue of risk-return tradeoff is extensively investigated, for example Hibbert et al. (2008) found negative asymmetric return-volatility relation for the S&P 500 index returns. Hatemi-J & Irandoust (2011) also supported the negative relationship between returns and volatility for the US stock market. Feunou et al. (2010) show that the risk-return relationship is nonlinear, time-varying, and crucially depends on the dynamics of conditional skewness of returns. Yakob and Sarath Delpachitra (2006) and Leon et al. (2007) found a positive relationship between conditional excess returns and conditional variance.

Although there is much literature on the dynamic relationship between risk and returns of developed stock markets in industrialized countries, there is a lack of similar studies for emerging stock markets, especially for Arab stock markets (To the best of my knowledge). Thus, one of the contributions of this paper is to provide empirical evidence on this relationship in two largest markets in the Arab world.

The main purpose of this paper is to investigate the relationship between stock market returns and their own volatility to see the existence of a time-varying risk premium in the Saudi Arabian and Egyptian stock markets. The paper applies both the GARCH-M and the EGARCH-M models to check for symmetric and asymmetric (bad and good news) impact of stock price volatility on the expected returns. The remainder of the paper is proceeds as follows: Section 2 gives an overview of the stock market in Saudi Arabia and Egypt. Section 3 presents the data and Section 4 gives a brief review of empirical methodology used. In section 5, the empirical results will be provided and finally, Section 6 concludes the paper.

2. Overview of Stock Market in Saudi Arabia and Egypt

2.1 Saudi Stock Market

The Saudi stock exchange (SSE) existence dates back to 1970s when it used to operate informally. In 1984, a Ministerial Committee comprising Ministry of Finance, Ministry of Commerce and SAMA (Note 8) was formed to regulate the market. SSE which is known locally by its Arabic name *Tadawul*. The Saudi stock market has several unique characteristics that differentiate it from other stock markets in the world. Share-trading activity is executed through commercial banks that are responsible for the settlement of transactions between buyers and sellers. The market is also characterized by the absence of a bourse and independent market-makers.

The overall performance of the Saudi stock market is measured by the Tadawul All Share Index (TASI) (Note 9), TASI reached its peak on 25th of February 2006, when it closed at 20,635. It was severely affected by the 2008 global crisis, like all the stock markets all over the world, and saw below 4000.

The Saudi stock market currently lists 144 publicly traded companies divided into fifteen sectors (as of August 15, 2010), Financials and Basic Materials sectors are the dominant sectors, together accounting for around 70% of market capitalization. The biggest two companies by market share are Al RAJHI Bank and SABIC, a petrochemical producer, both of which command around 11% of the market. The trading activity of the Saudi stock market can be considered very active with respect to the value of shares traded, the number of executed transactions and market capitalization (See Table 1) which suggests an increase in investor confidence during this time period.

Today, Saudi Stock market is the largest market in the entire Arab World. Based on market capitalization, the Saudi stock market ranks first in the Arab world with 319 billion U.S. dollars compared to an average of 65 billion dollars for the Arab countries participating in the Arab Monetary Fund Index (AMFI). Compared to the other Arab stock markets in the AMFI, the Saudi stock market had by far the largest market, with its value of shares traded amounting to 337 U.S. billion dollars in 2009 (Table 2). The second largest stock market is the Kuwaiti stock market, at 104 billion U.S. dollars. Additionally, the Saudi stock market is active and relatively liquid compared to the other markets in the AMFI as measured by market depth ratio and the turnover ratio respectively. At the end of 2009, the depth of the Saudi Stock Market was 86% of GDP compared to an average of 57% of GDP for Arab share markets, and was one of the most liquid markets in the Arab world with a turnover ratio of 106% compared to an average of 54% for Arab share markets in 2009 (Table 2).

2.2 Egyptian Stock Market

In contrast to the SSE, the Egyptian exchange is one of the oldest stock markets established in the Middle East and Africa. Egypt's stock exchange has two locations: the main location is in Cairo (established 1903) and the other one is in Alexandria established (1883).These two exchanges were competing with each other before they merged in recent

years. Today, both exchanges are governed by the same chairman and board of directors. They are commonly referred to as the Cairo and Alexandria Stock Exchange (CASE) and share the same trading, clearing and settlement systems, so that market participants have access to stocks listed on both exchanges.

The overall performance of the Egyptian stock market is measured by the Capital Market Authority (CMA) Index, which covers all listed stocks weighted in relation to their market capitalization. It can be viewed as an all share index that covers the broadest base of stocks. It is calculated and released daily by the CMA (Note 10).

2.3 Key Numbers of the TADAWUL and CASE

Table 1 provides some key figures for both markets. It is obvious that although CASE has relatively large number of listed companies, TADAWUL has a larger market capitalization, volume of trading, number of transactions and number of shares traded during the period of the study.

Table 1. Summary of Trading Activity in TADAWUL and CASE, 2007 – 2011

Year	Listed Companies	Value Traded ($ millions)	Market Capitalization ($ millions)	No. of Transactions	Shares Traded (In Million)
Saudi Stock Market (TADAWUL)					
2007	111	628,055.57	522,721.12	11343727	53,083.03
2008	127	483,122.22	246,809.85	11082545	54,441.98
2009	135	322,432.10	318,784.68	12197799	54,443.71
2010	146	192,445.39	353,419.01	16108992	31,555.34
2011	144	247,143.91	328,029.67	10356812	40,995.49
Egypt Stock Market (CASE)					
2007	435	49,388.19	134,903.52	8,161,607	10,512.79
2008	373	65,166.14	83,185.00	12,321,523	21,071.82
2009	306	50,812.70	86,267.22	13,300,653	28,243.25
2010	212	36,867.80	85,725.96	9,606,668	27,336.99
2011	213	18,081.29	48,679.23	5439868	16,669.04

Source: Compiled by the author based on data from the Tadawul website and AMF annual reports.

Table 2. Key Indicators of Arab World Share Markets, End of 2009

Capital Market	No. of Listed Companies	Market* Capitalization	Ratio to Total (%)	Value of Shares Traded*	Market Depth	Turnover Ratio
Saudi Arabia	135	318,803	35.29	337.070	86.3	105.7
Kuwait	205	93,824	10.38	103.772	73.5	110.6
Egypt	306	91,092	10.8	81.173	48.1	89.1
Qatar	44	87,930	9.73	25.317	106.8	28.8
Abu Dhabi	67	80,201	8.88	18.766	35.7	23.4
Morocco	73	74,186	8.21	16.226	80.0	21.9
Dubai	67	58,095	6.43	47.239	25.8	81.3
Jordan	272	31,889	3.53	13.641	105.8	42.8
Oman	120	23,616	2.61	5.905	44.5	25.0
Bahrain	49	16,263	1.80	473.0	75.2	2.9
Lebanon	11	12,843	1.42	1.038	39.9	8.1
Tunisia	52	9,237	1.02	1.360	24.5	14.7
Sudan	53	3,033	0.34	1.006	5.5	33.2
Palestine	39	2,377	0.26	500.0	Na.	21.0
Algeria	2	91	0.01	187.5	0.1	206.1

* Million of U.S. dollars.

Source: Quarterly Bulletin, Arab Monetary Fund, 2009.

3. The Data and Basic Statistics

3.1 Data for Analysis

The time series data used for investigating the risk-return relationship in this paper are the daily closing prices of the

Saudi Stock Market (SSM) index and the Capital Market Authority (CMA) index over the period from 1st January 2007 to 30th December 2011. Anderson and Bollerslev (1998) argue that the use of high frequency data (Like daily observations) is desirable to uncover the risk-return relationship. This is because it allows for a better measurement of risk and enables precise identification of the risk-return trade-off. This is because high frequency data produces better estimates of conditional volatility process. The closing prices of the two markets have been taken from the SSM website (http://www.tadawul.com.sa) and the CASE website (http://www.egyptse.com).

Daily returns r_t were calculated as the continuously compounded returns corresponding to the first difference in logarithms of closing prices of successive days:

$$r_t = \log\left(\frac{P_t}{P_{t-1}}\right) \tag{1}$$

where P_t and P_{t-1} denote the closing market index of SSM and CASE at the current (t) and previous day (t-1), respectively.

3.2 Summary Statistics

To specify the distributional properties of the daily returns series in *Tadawul* and CASE markets during the period of this study, some descriptive statistics are reported in Table 3.

Table 3. Descriptive Statistics of the Tadawul and CASE Return Series

Statistics	Tadawul Index Returns	CMA Index Returns
Mean	-0.000199	-0.001028
Maximum	0.090874	0.271107
Minimum	-0.103285	-0.515104
Standard Deviation	0.016795	0.028288
Skewness	-0.797523	-5.152991
Kurtosis	10.53532	106.0035
Jarque-Bera	3223.334*	582232.4*
No. of observation	1304	1288

Note: * denotes statistical significance at 1% level.

As can be seen from Table 3, the average return is negative in both markets. The distribution of returns differs markedly from normality given the observed skewness and excess kurtosis. Consequently, based on the Jarque-Bera (J-B) statistic, the null hypothesis of normality for the daily *Tadawul* and CMA returns has to be rejected at the 1% significance level. Moreover, Figures 1 and 2 present the pattern of the price index series and its returns for the *Tadawul* and the CMA during the study period.

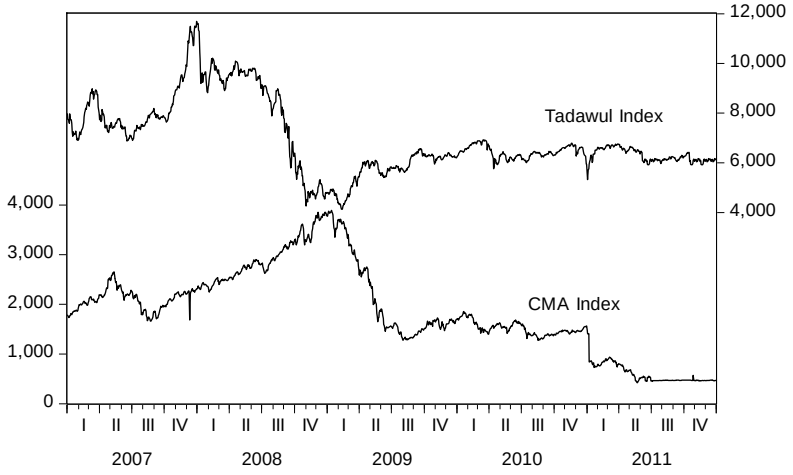

Figure 1. Tadawul and CMA Indices (January 2007 – December 2011)

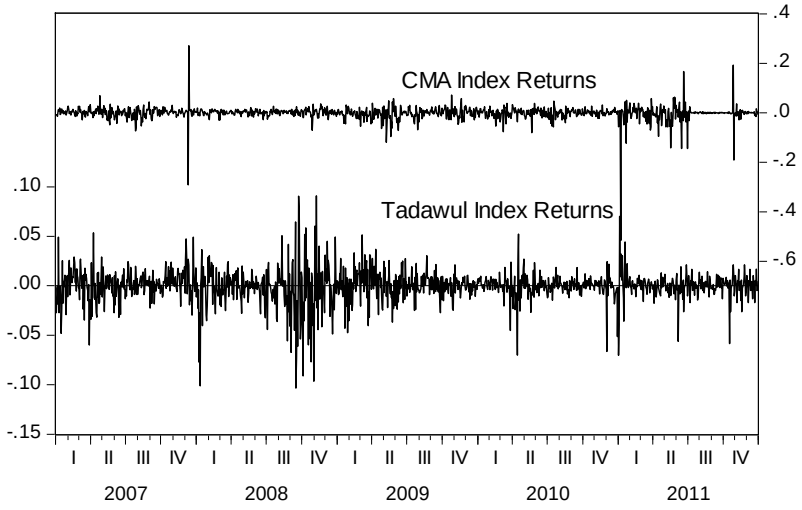

Figure 2. Returns of Tadawul and CMA Indices (January 2007 – December 2011)

3.2 Testing for Heteroscedasticity

One of the most important issues before applying the generalized autoregressive conditional heteroscedastic (GARCH) methodology is to first examine the residuals for evidence of heteroscedasticity. To test for the presence of heteroscedasticity in the residuals of the returns series, the Lagrange Multiplier (LM) test proposed by Engle (1982) is applied.

In summary, the test procedure is performed by first obtaining the residuals e_t from the ordinary least squares regression of the conditional mean equation which might be an autoregressive (AR) process, moving average (MA) process or a combination of AR and MA processes, i.e. ARMA process. For example, in the ARMA (1,1) process the conditional mean equation will be:

$$r_t = \phi_1 r_{t-1} + \varepsilon_t + \theta_1 \varepsilon_{t-1} \tag{2}$$

After obtaining the residuals e_t, the next step is to regress the squared residuals on a constant and q lags as in the following equation:

$$e_t^2 = \alpha_0 + \alpha_1 e_{t-1}^2 + \alpha_2 e_{t-2}^2 + \ldots + \alpha_q e_{t-q}^2 + \nu_t \tag{3}$$

The null hypothesis that there is no autoregressive conditional heteroscedasticity (ARCH) up to order q can be formulated as:

$$H_0 : \alpha_1 = \alpha_2 .. = \alpha_q = 0$$

against the alternative:

$$H_1 : \alpha_i > 0$$

for at least one i = 1, 2, …, q.

The test statistic for the joint significance of the q-lagged squared residuals is given by the number of observations times the R-squared (TR^2) of the regression (3). TR^2 is evaluated against the $\chi^2(q)$ distribution. This represents an asymptotically locally most powerful test (Rachev et al., 2007).

In this paper, first, an autoregressive moving average ARMA (1,1) model is employed for the conditional mean in the returns series as an initial regression, then, the null hypothesis that there are no ARCH effects in the residual series is tested up to lag 30 corresponding to one trading month. The results of this examination are summarized in Table 4.

Table 4. ARCH-LM Test for residuals of returns on the *Tadawul* and CMA market

	ARCH-LM test statistic	
Lags	Tadawul Index Returns	CMA Index Returns
5	275.9787*	37.434*
10	291.8388*	39.321*
15	316.7501*	40.446*
20	329.3702*	44.128*
25	339.4804*	47.387*
30	341.2769*	49.272*

Note: * denotes statistical significance at 1% level.

The ARCH-LM test results in Table 4 provide strong evidence for rejecting the null hypothesis for all lags included. Rejecting H_0 is an indication of the existence of ARCH effects in the residuals series of the mean equation and therefore the variance of the returns series of *Tadawul* and CASE indices are non-constant.

4. Econometric Methodology

The empirical investigation of this paper is conducted by means of the generalized autoregressive conditional heteroscedastic approach including both symmetric (GARCH(1,1)-M) and asymmetric (EGARCH(1,1)-M) models (Note 11) that capture most common stylized facts about index returns such as volatility clustering and leverage effect. The main reason to use GARCH framework lies in the fact that a conditional stochastic process generates the return data with a changing variance. Therefore, it is naturally expected that GARCH is the right tool to approach to the problem since it takes the changing variances into consideration. This GARCH specification is often interpreted in a financial context, where an agent or trader predicts this period's variance by forming a weighted average of a long term average (the constant), the forecast variance from last period (the GARCH term), and information about volatility observed in the previous period (the ARCH term). If the asset return was unexpectedly large in either the upward or the downward direction, then the trader will increase the estimate of the variance for the next period. In presenting these models, there are two distinct specifications, the first for the conditional mean and the other for the conditional variance. The models paper are estimated using maximum likelihood method as in Bollerslev and Wooldridge (1992) (Note 12) under the assumption of Gaussian normal distribution. The log likelihood function is maximized using Marquardt numerical iterative algorithm to search for optimal parameters.

4.1 The Generalized Autoregressive Conditional Heteroscedastic in Mean (GARCH-M) Model

In finance, the return of a security may depend on its volatility. To model such a phenomenon one may consider the GARCH-M model (Note 13) of Engle, Lilien, and Robins (1987), where "M" stands for "in mean". This model is an extension of the basic GARCH framework which allows the conditional mean of a sequence to depend on its conditional variance or standard deviation. In this paper, the following simple specification GARCH (1,1) -M is used:

$$\text{Mean equation} \qquad r_t = \mu + \lambda\sigma_t^2 + \varepsilon_t \tag{4}$$

$$\text{Variance equation} \qquad \sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \tag{5}$$

where $\omega > 0$, $\alpha_1 \geq 0$ and $\beta_1 \geq 0$, and

r_t = return of the asset at time t,

μ = average return,

ε_t = residual returns, defined as:

$$\varepsilon_t = \sigma_t z_t \tag{6}$$

where z_t is standardized residual returns (i.e. realization of iid random variable with zero mean and variance 1), and σ_t^2 is conditional variance.

The constraints $\alpha_1 \geq 0$ and $\beta_1 \geq 0$ are needed to ensure that σ_t^2 is strictly positive (Poon, 2005).

In this model, the conditional mean equation is written as a function of constant, the conditional variance (σ_t^2) as an explanatory variable, and error term. The parameter λ is called the risk premium parameter. A positive λ indicates that the return is positively related to its volatility. In other words, a rise in mean return is caused by an increase in conditional variance as a proxy of increased risk. The conditional mean at time t is denoted $E_t\left(\frac{r_t}{r_{t-1}}\right)$ or μ_t and the conditional variance at time t is denoted $V_t\left(\frac{r_t}{r_{t-1}}\right)$ or σ_t^2 (Engle 1982).

The conditional variance equation models the time varying nature of volatility of the residuals generated from the mean equation. Since σ_t^2 is the one – period ahead forecast variance based on past information, it is called the conditional variance. The conditional variance equation specified as a function of three terms: (i) A constant term: ω ; (ii) News about volatility from the previous period, measured as the lag of the squared residuals from the mean equation: ε_{t-1}^2 (the ARCH term); and (iii) Last period forecast variance: σ_t^2 (the GARCH term). Engle, Lilien, and Robins assume that the risk premium is an increasing function of the conditional variance of ε_t ; in other words, the greater the conditional variance of returns, the greater the compensation necessary to induce the agent to hold the long – term asset Enders (2004).

4.2 The Exponential GARCH (EGARCH) Model

Even if the GARCH models (including GARCH-M) successfully capture the thick tail returns, and the volatility clustering, they are poor models if one wishes to capture the leverage effect since the conditional variance is a function only of the magnitudes of the past values and not their sign. In financial time-series, it has been stated that volatility behaves differently depending on if a positive or negative shock (Note 14) occurs. This asymmetric relationship is called leverage effect, and describes how a negative shock causes volatility to rise more than if a positive shock with the same magnitude had occurred. To capture this asymmetry, Nelson (1991) developed the exponential GARCH (EGARCH) model. This model captures asymmetric responses of the time-varying variance to shocks and, at the same time, ensures that the variance is always positive.

The conditional variance equation of the EGARCH (1,1)-M model – which will be employed in this paper – has the following specification (Note 15):

$$Ln(\sigma_t^2) = \omega + \beta_1 Ln(\sigma_{t-1}^2) + \alpha_1 \left\{ \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| - \sqrt{\frac{2}{\pi}} \right\} - \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \tag{7}$$

where ω , β_1 , α_1 and γ are constant parameters, $Ln(\sigma_t^2)$ is the one-period ahead volatility forecast. This implies that the leverage effect is exponential rather than quadratic and forecast of conditional variance are guaranteed to be nonnegative, ω is the mean level, and $Ln(\sigma_{t-1}^2)$ is the past period variance. Unlike the GARCH model, the EGARCH model allows for leverage effect. If γ is negative, leverage effect exists. That is an unexpected drop in price (bad news) increases predictable volatility more than an unexpected increase in price (good news) of similar magnitude (Black, 1976; Christie, 1982). If α is positive, then the conditional volatility tends to rise (fall) when the absolute value of the standardized residuals is larger (smaller).

5. Results

As reported in the data description part, when the residuals were examined for heteroscedasticity, the ARCH-LM test provided strong evidence of ARCH effects in the residual series. To model this conditional heteroscedasticity, the paper proceeds by applying the GARCH-in-mean models. The results of estimating the two GARCH specifications for the two markets are presented in this section.

Beside the estimation output of the two GARCH-in-mean models, diagnostic test results for these models are also provided, in particular for testing whether there are still ARCH effects left in the residuals of the estimated models (Note 16). Table 5 shows the parameter estimates of the two GARCH models for the period under study.

Table 5. Estimation results of the GARCH(1,1)-M and EGARCH(1,1)-M

Coefficients	Saudi Market		Egyptian Market	
	GARCH (1,1)-M	EGARCH (1,1)-M	GARCH (1,1)-M	EGARCH (1,1)-M
Conditional Mean Equation				
μ	0.000235	0.000484	0.001610*	0.000887*
λ	0.928367	0.940847	-0.707514	-1.71E-05
Conditional Variance Equation				
ω	6.79E-06**	-0.602968**	9.91E-05**	-1.979064**
α	0.104581**	0.123499**	0.376434**	0.382457**
β	0.868009**	0.848292**	0.653892**	0.762887**
γ	-	-0.099191**	-	-0.220823**
$\alpha+\beta$	0.97259	0.971791	1.030326	1.145344
Log-Likelihood	3750.964	3759.010	2972.531	2983.736
ARCH-LM Test for heteroscedasticity				
Statistic	27.01048	21.38055	1.039912	1.974057
Prob.	0.6227	0.8756	1.0000	1.0000

Note: * and ** denote significance at the 5% and 1% level respectively.

From the results of the variance equations reported in Tables 5, the first three coefficients ω (constant), ARCH term (α) and GARCH term (β) are statistically significant and exhibit the expected sign for both markets. The significance of α and β indicates that, lagged conditional variance and lagged squared disturbance have an impact on the conditional variance, in other words this means that news about volatility from the previous periods have an explanatory power on current volatility. Moreover, Table 5 shows that the sum of the two estimated ARCH and GARCH coefficients $\alpha+\beta$ (persistence coefficients) for the Egyptian market is larger than one, suggesting that the conditional variance process is explosive. However, for the Saudi market, the sum of the ARCH and GARCH coefficients is very close to one which is required to have a mean reverting variance process, indicating that volatility shocks are quite persistent, but not explosive. Furthermore, the results of asymmetric EGARCH(1,1)-M model in Table 5 indicate that the asymmetric (leverage) effect captured by the parameter estimate γ is statistically significant with negative sign for both markets, indicating that negative shocks imply a higher next period conditional variance than positive shocks of the same magnitude, which indicates the existence of leverage effect in the returns of the two markets during the study period.

From estimation results in Table 5, the estimated coefficient (risk premium) (λ) of σ^2 in the mean equation is negative for the Egyptian market, which indicates that the mean of the return sequence negatively depends on conditional variance. This result is similar to those reached by Bekaert and Wu (2000), Breen et al. (1989), Campbell (1987), Fama and Schwert (1977), Glosten et al. (1993), and Nelson (1991) who report a negative relationship between expected return and conditional volatility. For the Saudi market, the risk premium coefficient is positive a result which is consistent with the theory of a positive risk premium on stock indices which states that higher returns are expected for assets with higher level of risk.

The ARCH-LM test statistic for all GARCH models (where ARCH and GARCH terms are taken to be of order 1) did not exhibit any additional ARCH effects remaining in the residuals of the models. This shows that the variance equations are well specified for the two markets.

6. Conclusions and Future Directions for Research

This paper has empirically investigated the relationship between stock market returns and volatility (risk) for the Saudi and Egyptian stock indices over the period of January 1, 2007 to December 30, 2011. The paper applied both the GARCH-M and the EGARCH-M models as originally developed by Engle (1982) and generalized by Bollerslev (1986) to check for symmetric and asymmetric (bad and good news) impact of stock price volatility on the expected returns. Based on daily closing prices of the general market index from the two markets, the empirical results of the paper provide strong evidence that daily returns can be well characterized by the GARCH approach; the returns on both markets showed a significant departure from normality and the existence of heteroscedasticity in the residuals

series. Based on the two estimated models, the results indicate that the conditional volatility is an explosive process for Egypt while it is quite persistent for Saudi market. Furthermore, EGARCH (1,1)-M model shows a significant evidence for the existence of the leverage effects. The paper reports a negative relationship between expected returns and conditional volatility (risk) for Egypt and positive relation for Saudi market, a result which is consistent with the theory of a positive risk premium on stock indices which states that higher returns are expected for assets with higher level of risk. Finally, it would be interesting to further investigate the risk-return trade-off using different econometric models, for example use of multivariate GARCH-M models might give more accurate results.

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Notes

Note 1. Financial markets participants are generally use stock market volatility – that is, the size of fluctuations in stock market returns – to measure stock market risk.

Note 2. This means large changes tend to be followed by large changes and small changes tend to be followed by small changes (Mandelbrot, 1963).

Note 3.This means large changes tend to be followed by large changes and small changes tend to be followed by small changes (Mandelbrot, 1963).

Note 4. A time series is said to be heteroscedastic if its variance changes over time, otherwise it is called homoscedastic.

Note 5. The Capital Asset Pricing Model (CAPM), developed by Sharpe (1964) and Lintner (1965), is the most popular computational equation for the estimation of investment risk. CAPM argues that beta, or the systematic risk is the only relevant risk measure for investment and the relation between the returns of any asset is linearly related to its market beta.

Note 6. Since investment returns reflect the degree of risk involved with the investment, investors need to be able to determine how much of a return is appropriate for a given level of risk. This process is referred to as "pricing the risk". In order to price the risk, we must first be able to measure the risk (or quantify it) and then we must be able to decide an appropriate price for the risk we are being asked to bear.

Note 7. Merton (1973) provides the seminal work on the dynamic risk return tradeoff in equilibrium. He derives a linear relationship between the conditional mean of the return on the wealth portfolio in relation to its conditional variance and the conditional covariance with variation in the investment opportunity set,

Note 8. The Saudi Arabia Monetary Agency (SAMA) was responsible for supervising the market from 1984 until 2003. In July 2003, authority was handed over to the newly formed Capital Market Authority (CMA). The CMA is now the sole regulator and supervisor of Saudi Arabia's capital markets, and issues the necessary rules and regulations to protect investors and ensure fairness and efficiency in the market (Talat et al., 2011).

Note 9. The index was developed with a base value of 1000 in 1985 and it was restructured on 06/30/08.

Note 10. For a detailed discussion of the Egyptian Stock Market see for example, Sourial and Mecagni (1999) and Aly, et al. (2004).

Note 11. In the symmetric models, the conditional variance only depends on the magnitude, and not the sign, of the underlying asset, while in the asymmetric models the shocks of the same magnitude, positive or negative, have different effect on future volatility.

Note 12. Maximum likelihood estimator (MLE) is the most popular method where parameters are chosen such that the probability of occurrence of data under its assumed density function is the maximum. MLE is widely used because it produces an asymptotically normal and efficient parameter estimates (Justin 2005).

Note 13. Among others, Chou (1988) using a GARCH-M model found a positive relation between returns and conditional variance and also found that the GARCH-M model was more reliable than traditional econometric models such as two-stage least squares used by Pindyck (1984), and Poterba and Summers (1986).

Note 14. In macroeconomic analysis, financial markets and corporate finance, a negative shock usually implies bad news, leading to a more uncertain future. Consequently, for example, shareholders would require a higher expected return to compensate for bearing increased risk in their investment (Wang, 2003).

Note 15. The conditional mean equation remains as in the GARCH-M model (see equation 4).

Note 16. If the variance equation of GARCH model is correctly specified, there should be no ARCH effect left in the residuals.

Economic and Policy Implications of Industry Interdependence: An Input-output Approach

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Abstract

The study provides an overview of the fundamental principles of input-output theory, the steps involved in linkage analysis and the estimation of industry multipliers. These have been estimated using a 'new' symmetric input-output table for the Maltese economy for 2007 which is used as an example to draw policy-relevant lessons for countries with relatively small open economies. On the basis of these estimates it is argued that (1) the effect of an increase in final demand will go beyond the industry directly affected by the initial change in expenditure, (2) that multipliers provide an important guide to policy makers that are concerned with making optimal use of their scarce resources, (3) that governments of countries that depend heavily on foreign direct investment can target labour intensive industries to tilt the balance in favour of the worker, (4) that a firm-specific approach is preferable to expansionary fiscal policy when a country is heavily dependent on imported products, and (5) that market distortions and inefficiencies are more damaging in those sectors that have strong forward linkages with other sectors in the domestic economy.

Keywords: input-output model, inter-industry linkages, multiplier analysis, Malta

1. Introduction

Input-output analysis originated in 1758 when François Quesnay published the *Tableau Économique* portraying the sales and purchases between the various industries and institutions in an economy. In 1874, Leon Walras further developed input-output modelling by providing a theoretical formulation of an economic system – a branch in economics today known as general equilibrium theory. However, most input-output models in operation today rely on the model developed by Wassily Leontief in 1941. His work was considered a breakthrough in relating Walras' general equilibrium theory to data for the American economy. By bringing together the theoretical framework of industry interdependence and data, input-output analysis could be used as a guide for policy decisions. Indeed, to this day it has been applied to the areas of environment, trade, productivity and industry impact analysis amongst others.

Input-output analysis becomes indispensible for rational policy formulation where two conditions hold: (1) inputs as well as outputs enter society's objective function directly (as in the case of employment, limited energy resources and pollution) and (2) where the economy in question is open, so that macroeconomic policy is largely powerless to increase employment or to influence the use of other inputs (Baumol and Wolff, 1994). Economies the world over are becoming increasingly open, none more so than Malta where exports and imports together amount to around 200% of GDP. Thus, the study of industry interdependence in Malta provides an interesting application of input-output analysis and will be used as an example to draw policy-relevant lessons for Malta and more generally for countries with relatively small and open economies.

Officially published for the first time in the early 1960s, the Maltese industrial input-output table focused solely on direct production sectors of the economy. The last publication of the table dates back to the 1998 issue of the *National Accounts of the Maltese Islands*. Since then, the Maltese economy has undergone significant restructuring, not only away from direct production and towards market services, but also within the direct production sector itself. In 2010, market services accounted for 59% of Malta's Gross Domestic Product (GDP), up from 48% in 1998. To a large extent this reflects developments in the real estate, renting and business activities sector as well as the other community, social and personal activities sector (Note 1). Activity within the manufacturing sector itself has also shifted towards higher value-added activities as evidenced by the decreasing share of the manufacturing of textiles sector and the emergence of the pharmaceutical and aviation maintenance industries. Thus, any serious analysis of

the Maltese economy at a micro or sector level calls for the development of an input-output table based on more recent data that reflects these developments.

Seen in this light, the paper is intended to serve two goals. First it has the purpose to act as a guide to the steps involved in the specification and application of an input-output model. Second, it attempts to draw policy-relevant conclusions from applications of a 'new' industry-by-industry input-output table constructed for the Maltese economy for 2007. Issues relating to the theoretical foundations of input-output analysis and the construction of the 'new' table are presented in section 2. Multiplier and linkage analysis follow in sections 3 and 4 respectively, while section 5 discusses the limitations of the analysis and section 6 concludes.

2. Theoretical Foundations of Input-output Analysis

A symmetric input-output table traces the path by which incomes flow through the economy between producers and consumers. On the one hand, it shows how the output of each sector is distributed among institutions and other industries in the economy. On the other, it shows the inputs to each industry from other industries and institutions. These are algebraically represented in Table 1 in order to facilitate the discussion.

The heart of the input-output table is the inter-industry transactions table. It depicts the production relationships in the economy as represented by elements x_{ij}. In this table, the column sectors are consuming sectors and the row sectors are the producing sectors. Thus, any one element in the matrix represents the output value that the row sector delivers to the column sector. It follows that the sum across columns of the inter-industry matrix is the intermediate outputs vector, while the sum across the rows is the intermediate inputs vector.

Table 1. Algebraic Input-Output Table

	A	B	C	FD	T
A	x_{11}	x_{12}	x_{13}	y_1	z_1
B	x_{21}	x_{22}	x_{23}	y_2	z_2
C	x_{31}	x_{32}	x_{33}	y_3	z_3
FP	v_1 m_1	v_2 m_2	v_3 m_3		
T	q_1	q_2	q_3		

The quadrant made up of elements y_i describes consumption behaviour, characterised by the consumption patterns of households, government and investors as well as exports. Since goods transferred to these institutions would not normally reappear in the economy, these are grouped under the final demand (FD) category.

The final payments (FP) quadrant incorporates two major variables, namely, value-added and imports. The latter consists of sectoral imports (m_j) while the former represents wages and salaries, profits, interest, dividends and taxes. It is called sectoral value-added (v_j) because it is the value that a sector adds to the goods and services it uses as inputs in order to produce a final product. Thus the value-added vector measures each sector's contribution to GDP.

From a circular flow perspective, the final demand quadrant is where the spending cycle begins and where the finished goods end up to satisfy the needs of consumers. The final payments quadrant is where the production cycle starts, with households and other resource owners receiving compensation for their contribution to the production process. The overlap between these two cycles is represented by the inter-industry transactions matrix that traces the relationships describing the technology of production of the various sectors in the economy.

A concise way of representing the relationship between all three quadrants is to use matrix algebra. Viewed as an equilibrium model, the data in the input-output table can be expressed in terms of identities, behavioural assumptions and equilibrium conditions (Schaffer, 1999). The set of identities is given by

$$z_i = \sum_j x_{ij} + y_i \tag{1}$$

and

$$q_j = \sum_i x_{ji} + v_j + m_j \tag{2}$$

where z_i is total demand, x_{ij} are sales by sector i to sector j, y_i is final demand, q_j is total supply, x_{ji} is the sum of all purchases by sector j from sectors i, v_j is sectoral value added and m_j are sectoral imports.

The equilibrium condition is based on the assumption that over a long period of time it is irrational to supply more than is used and impractical to consume more than is produced. Hence, it must hold that for every sector

$$q_j = z_i \tag{3}$$

such that column totals equal row totals for all sectors in the economy.

The behavioural assumption is then given by

$$a_{ij} = x_{ij} / q_j \tag{4}$$

where a_{ij} is the technical coefficient showing the proportion in which inputs of each sector combine the goods and services which they purchase to produce their own output. In other words, if a_{21} is 0.5 it means that 50% of sector A's inputs are supplied by sector B. Whilst this indicator *per se* is already very informative and useful for the formulation of policy, the contribution of the input-output table to analytical purposes does not end here. In addition to providing a detailed breakdown of sector inputs, the input-output table can be used to calculate the indirect impacts on the economy as each sector affected directly by changes in final demand turns to other sectors for inputs. This thinking sets the stage for the topic of the next section: the multiplier analysis.

3. Multiplier Analysis

In practice, the multiplier is one of the more useful analytical techniques. It is a ratio that measures the impact on the total economy as a result of an initial autonomous change in any of the final demand components. While the impact on the industries directly affected by a change in demand can be measured with relative little difficulty, when one recognises the interdependence of economic activity, it is apparent that the total impact will not be limited to the sectors directly affected by the initial change in demand.

An aggregative multiplier – as originally developed by John Maynard Keynes (1936) – is a useful analytical tool, but it does not show the details of how multiplier effects work through the economy. Indeed, some advantage is gained by disaggregation. Consider the case of an increase in the demand for financial services. To increase its service provision, the financial services sector will demand more computers, electricity and stationery. The manufacturers of stationery and computers and the providers of electricity will in turn have to buy more raw materials and fuel to increase their production. Although part of this expenditure will finance import consumption and hence leaks out of the economy, the intermediate purchases process will continue to repeat itself until leakages reduce the effect of the initial increase in the demand for financial services to a negligible amount.

This process can be conveniently expressed using the mathematical representation adopted in section 2. Substituting $a_{ij}q_j$ for x_{ij} in equation (1) and q_j for z_j in equation (4) gives

$$q'_i = \sum_j a_{ij} q'_j + y'_i \tag{5}$$

Assuming A to represent the matrix made up of a_{ij} and y to represent the column vector y_i we get

$$q = (I - A)^{-1} y \tag{6}$$

Equation (6) gives the well known static input-output system developed by Leontief (1966). The core of the model lies in the *i*-by-*j* Leontief Inverse matrix $(I\text{-}A)^{-1}$. Also known as the total requirements matrix, it portrays the relationship between final demand (y) and total output (q). Whilst in the direct requirements matrix A, elements a_{ij} represent the (direct) inputs from sector i to produce a euro worth of sector j's output, the corresponding elements in the Leontief inverse matrix represent the direct as well as the indirect increase in production of sector i following a euro increase in sector j's output.

Formally the Leontief inverse matrix can be expressed as an iterative procedure that captures both the direct and indirect requirements for domestic intermediates following a one euro change in final demand. This can be written as

$$(I - A)^{-1} y = y + Ay + A^2 y + \ldots + A^n y \tag{7}$$

Where matrix A represents the direct input requirements and matrices A^2 to A^n represent the indirect requirements for intermediates at the previous stages of production. Each term is calculated as the previous indirect effect multiplied by the direct requirements matrix. Since each element in the direct requirements matrix is less than one, each successive term representing indirect effects is smaller than the previous.

Using equation (6), the total impact on an economy's output following a change in final demand is given by

$$\Delta q = (I - A)^{-1} \Delta y \tag{8}$$

such that the output multiplier is equal to the change in total output (Δq) divided by the change in final demand (Δy). For an individual industry j, the output multiplier is given by

$$mult_{OUT_j} = \sum_i TR_{ij} \tag{9}$$

where TR_{ij} is the total requirements matrix $(I\text{-}A)^{-1}$. Therefore, the output multiplier for industry j is simply the sum of column j in the total requirements matrix across all industries i. Combining the equation for the output multiplier with the technical coefficients for value added we get the value added multiplier

$$mult_{VA_j} = \sum_i \left(v_j / q_j\right) TR_{ij} \tag{10}$$

Similarly, we can get income and employment multipliers by combining equation (9) with the technical coefficient for income and the employment-output ratio respectively. The income multiplier is given by

$$mult_{INC_j} = \sum_i \left(w_j / q_j\right) TR_{ij} \tag{11}$$

where w_j is the wage share in total output of sector j. The employment multiplier is given by

$$mult_{EMP_j} = \sum_i \left(e_j / q_j\right) TR_{ij} \tag{12}$$

where e_j/q_j is the employment-output ratio.

It is clear that the estimates of multipliers depend on the transactions matrix A. The matrix should include all those sectors and institutions which base their buying decisions on their incomes. In the input-output model, these activities are assumed endogenous since their behaviour is determined within the system. Other activities of final demand, such as exports, are decisions made outside the system and so are called exogenous activities. More specifically, industries are normally classified as endogenous while final demand institutions are normally considered exogenous. However, this distinction is not quite clear cut.

While traditionally the household sector is classified as a final demand institution, it is frequently treated as part of the transactions table. Households sell labour and managerial skills to industries and receive wages and salaries in return. With the income they receive they buy food, clothes and other products and set in motion a new cycle. Accounting for approximately 17% of total expenditure, the household institution is a critical part of the Maltese economy. Hence, the compensation of employees and household expenditure are sometimes incorporated within the transactions matrix A. Thus, the multipliers referred to above can be generated from two different models, namely, Type I and Type II.

The Type I multiplier is sometimes referred to as a "simple" multiplier since it takes into account only direct and indirect changes resulting from of a euro increase in final demand. It covers both the change in industrial purchases of industries directly affected by the change in final demand and also the change in purchases of those industries indirectly affected by the change in demand. Type II multipliers are a more realistic measure which take into account the direct and indirect effects *plus* induced changes in income resulting from increased consumer spending. The induced effect reflects the change in consumer spending that is generated by changes in labour income as a result of direct and indirect effects of an economic activity. Thus, for each sector, the Type II multiplier will always be larger than its Type I counterpart. Miller and Blair (2009) pointed out that "it is generally conceded that Type I multipliers probably underestimate economic impacts (since household activity is absent) and Type II multipliers probably give an overestimate (because of the rigid assumptions about labour incomes and attendant consumer spending)."

On the basis of the above discussion, this section presents estimates and analysis for both these multipliers for the Maltese economy. In contrast to previous input-output analysis for the Maltese economy – which focused solely on tourism multipliers (Briguglio, 1992; Mangion and Vella, 2000; Blake, Sinclair and Sugiyarto, 2003) – the study presents multiplier estimates for major industries in the Maltese economy so as to provide a guideline for industrial policy formulation. These were estimated using the 'new' input-output table which has been constructed on the basis of the 2001 Supply and Use Tables (SUT) published by Malta's National Statistics Office. Following the conversion of SUT into similar prices, these have been transformed into a symmetric input-output table using the fixed product sales structure methodology, an assumption commonly adopted by a number of national statistical agencies worldwide, including Denmark, Hungary, the Netherlands, Finland, Canada and Norway (Eurostat, 2000) (Note 2). Compared to the 1998 input-output table, the 'new' input-output table covers a wider range of sectors, in part reflecting the restructuring the Maltese economy has undergone throughout the past decade.

Table 2 presents the Type I multiplier estimates for ten major industries in the Maltese economy. It shows that the output multiplier is highest in the transport and communication sector at 1.43. This means that an increase in demand for the transport and communication sector's output would stimulate a relatively high level of domestic output in the Maltese economy. Specifically, a €1 increase in the demand for transport and communication products and services would result in an additional €0.43 increase in output in the economy. More generally, while the direct effect of a euro increase in output is one, the total average impact is 1.34, implying that the final impact on output is greater than the initial change in final demand.

Table 2. Type I Multipliers

	Output	Value-added	Income	Employment
Agriculture	1.43	0.66	0.21	0.000026
Manufacturing	1.42	0.48	0.26	0.000017
Electricity, gas and water supply	1.26	0.48	0.66	0.000035
Construction	1.36	0.73	0.36	0.000043
Commerce*	1.39	0.82	0.38	0.000036
Transport and communication	1.43	0.69	0.31	0.000020
Financial services	1.25	0.93	0.75	0.000027
Business services	1.33	0.88	0.24	0.000020
Public Administration	1.28	0.89	0.68	0.000031
Other services**	1.28	0.88	0.50	0.000031

*Includes wholesale and retail trade, hotels and restaurants.

**Includes education, health, cultural and gaming activities.

Although the output multiplier represents total requirements per euro of final output, it is not a particularly useful concept except as an indicator of the degree of structural interdependence between industries in the economy. When analysing impacts on the economy, we are more interested in income and employment multipliers. They are of particular interest because they represent income to people and jobs and therefore have a direct impact on household welfare. Indeed, at a macro level, estimates of impacts on the economy are measured as per change in GDP and not output. As noted in section 2, this is equivalent to value added. Hence, the final impact on the Maltese economy can be estimated using value added multipliers.

This was highest for the financial services sector, followed by relatively high value-added multipliers for other service activities such as other services, public administration, business services and commerce. The results show that a euro increase in the financial services sector would generate €0.93 of value added in the economy. In contrast, a euro increase in the consumption of manufacturing goods would result in only €0.48 of value added in the economy. Consequently, it can be argued that more value added is generated in the economy by €1 expenditure on financial services output than by expenditure on manufacturing goods worth an equivalent amount.

This might suggest that the contribution of the financial services sector to the Maltese economy is greater than that of the manufacturing sector. However, this statement may not necessarily be correct. First, the high level of *sectoral aggregation* may not reflect the true impact that some sectors have on the economy. The high value-added pharmaceutical sub-sector within the manufacturing sector is a case in point. Because the manufacturing sector largely consists of sub-sectors with low value added coefficients, using the manufacturing sector's value added multiplier as a proxy for the impact of investment in pharmaceutical companies would be misleading. Thus, a higher level of disaggregation would render the results of the analysis more suitable for the purposes of policy making. Second, the multipliers only present results per euro increase in final demand and do not account for the *size* of the sector. Thus, it could very well be the case that investment in a sector with a low value added multiplier would have a relatively large impact on the economy if the level of investment is significantly large. Perhaps the best example of that is the relatively large electronics sub-sector in the Maltese economy that has a low value added coefficient of 0.25. If demand for the output of this sub-sector were to suddenly collapse to zero, it is estimated that it would impact the Maltese economy by as much as 4.5% of GDP due to the fact that it accounts for approximately 50% of Malta's exports of goods.

Another important point relates to the fact that the value-added multiplier for all sectors is less than one. This means that an additional euro of expenditure will generate a total impact on the country's GDP which is less than €1. This has significant policy implications. Consider the case where the Maltese government adopts an expansionary fiscal policy and increases its expenditure by the sum of €1 million. If this were to be spent on the construction sector,

according to the estimates presented in Table 2, this would increase GDP by €730 000 when indirect effects are also included – some €270 000 less than the initial expenditure. Although part of this leakage may be related to saving and taxes which may be later re-spent in the Maltese economy, the bigger share of this leakage relates to imports. If one thinks of imported products as substitutes for local production, this becomes a crucial observation. Indeed, one of the more important lessons from the application of input-output analysis is that the more a country depends on imported goods and services instead of its own production, the more economic activity leaks away from the local economy and consequently the lower the impact of a given level of stimulus to the economy. This goes some way to justify the firm-specific targeted approach typically adopted by governments in small island states when their economies are in distress.

Table 2 also shows estimates for income multipliers. They reveal that portion of the value added multipliers that relates to wages and salaries rather than profits (Note 3). More specifically, it shows labour income generated in the Maltese economy following a euro increase in demand. It is highest in financial services, public administration and electricity sectors, indicating that all three sectors are relatively labour intensive. For example, income would be expected to increase by €0.75 following a euro increase in demand for financial services, partly reflecting the high ratio of wages to total output for the sector. Similarly, low income multipliers for some sectors, such as agriculture and business services, reflect a low wage share in total industry output. This has important implications for small open economies like Malta which tend to depend heavily on foreign direct investment to generate economic growth. Typically, a significant share of profits earned by these multinationals are remitted abroad such that a large share of value added generated by operations in a subsidiary company in Malta leak out of the Maltese economy. Within this context, governments in countries which depend heavily on foreign direct investment ought to encourage investment in labour intensive industries such that they minimise the share of value added that leaks out of their economies.

A closely related concept is the employment multiplier which, in practice, is the most commonly sought multiplier. This is due to the fact that economic impact analysis is often preoccupied with the employment effects of industrial expansion or company closures. For each sector, the employment multiplier represents jobs created per euro of additional final demand. For example, if the final demand for the construction sector were increased by €1 million, a total of 43 jobs would be created in the economy. Table 2 shows that in the case of Malta the employment multipliers are highest in the construction and commerce sectors.

Despite the usefulness of the Type I multiplier, almost all input-output analysts nowadays use Type II multipliers simply because any realistic estimates of impacts caused by changes in final demand should not overlook the relations between household income and spending. As noted above, an autonomous increase in expenditure will generate more economic activity and therefore create new employment opportunities which, in turn, increase personal income. Since household consumption expenditure is understood to depend primarily on disposable income, for purposes of the estimation of the Type II multiplier the household sector has been incorporated into the transactions table *A*. This captures the process that an increase in household income leads to increases consumption expenditure and generates a new stimulus which sets in motion further rounds of interdependent transactions.

Indeed, the Type II multiplier does not only capture direct and indirect impacts, but also includes the induced effect. The Type II multipliers for output, value added, income and employment are shown in Table 3. It is noticed that in some cases sector rankings of the Type I and Type II multipliers differ. This difference is attributed to the consumption induced effect and is, as expected, relatively higher for the more labour intensive sectors.

Table 3. Type II Multipliers

	Output	Value-added	Income	Employment
Agriculture	1.89	0.77	0.26	0.000029
Manufacturing	1.97	0.61	0.32	0.000021
Electricity, gas and water supply	2.66	0.80	0.82	0.000046
Construction	2.13	0.91	0.45	0.000050
Commerce*	2.21	1.01	0.47	0.000043
Transport and communication	2.08	0.85	0.38	0.000026
Financial services	2.84	1.30	0.93	0.000040
Business services	1.83	1.00	0.29	0.000024
Public Administration	2.73	1.23	0.84	0.000043
Other services**	2.34	1.13	0.62	0.000040

*Includes wholesale and retail trade, hotels and restaurants.

**Includes education, health, cultural and gaming activities.

Adopting an interpretation similar to that of Type I multipliers, the higher the Type II multipliers the greater the impact on the economy following some change in final demand. The relatively high multipliers for the other services, financial services, public administration and electricity, gas and water supply sectors are indicative of the strong economic linkage of these sectors with other sectors in the economy. The relatively low multipliers for sectors such as business services and manufacturing indicate that they have relatively little connection with other domestic sectors.

In contrast with the results derived from the Type I multiplier model, the Type II output multiplier is highest in the financial services sector. Overall, there is a shift at the top of the rankings from those sectors that are intensive in the use of intermediate inputs towards those that are labour intensive. Indeed, while agriculture, transport and manufacturing topped the rankings for the Type I output multiplier, it is financial services, public administration and the electricity sectors that top the rankings for Type II output multipliers. However, value added, income and employment Type II multipliers all seem to yield similar results in terms of ranking to the corresponding Type I multipliers.

The problem with the Type II multiplier is that it assumes zero taxes on household income and zero household savings. Consequently, Type II multipliers tend to overestimate the "true" impact on the economy. An attempt to overcome this and other deficiencies in the standard input-output model was undertaken by Bonnici (1980). However, results are not directly comparable to the estimates presented in this paper.

4. Linkage Analysis

The multiplier analysis is useful when interest lies in estimating the impact of changes in final demand but ignores the role of supply. Linkage analysis overcomes the one-sided view of a demand-led economy by considering both forward and backward linkages. Backward linkages capture the linkages of a sector with upstream industries (i.e. sectors from which the sector purchases inputs) while forward linkages capture linkages with downstream industries (i.e. sectors to whom the sector sells its output). In other words, forward linkages capture changes in the downstream sectors' output as a result of a one unit increase in value added in a particular sector while backward linkages capture changes in the upstream sectors' production driven by a one unit increase final demand.

When backward linkage analysis is understood to include both direct and indirect effects (Yotopoulos and Nugent, 1976) the backward linkage is equal (or proportional) to the Type I output multiplier discussed in section 3. Forward linkages are similar but work in the opposite direction. Instead of considering the demand created by (say) the electricity sector, increased output in the electricity sector is viewed as being supplied to other sectors in the economy. This type of analysis would be particularly useful if one were to consider competitiveness implications following an increase in electricity prices.

Following the work of Ghosh (1958), rather than assuming that intermediate inputs are proportional to column totals, forward linkage analysis assumes that they are proportional to row totals. This is given by

$$b_{ij} = x_{ij} / z_i \tag{13}$$

such that intermediate flows are supply-led rather than demand-led. Therefore, whilst backward linkages are computed using input coefficients as per equation (3), forward linkages are estimated using output coefficients as per equation (13). Formally, the forward linkage of industry j is given by

$$FL_j = \sum_j TO_{ij} \tag{14}$$

where TO_{ij} is the total output matrix $(I\text{-}B)^{-1}$ and B is a matrix made up of elements b_{ij}.

Table 4 shows the backward and forward linkages for the ten sectors under analysis. Following Rasmussen (1956) the estimates have been normalised to one such that a backward linkage greater than one implies that the sector has above average dependency on domestic sectors for its input requirements and is thus backward oriented. The opposite is true for values less than one. On the other hand, a forward linkage greater than one implies that domestic sectors have above average dependency upon the sector in question and is thus forward oriented. On this basis, it is possible to identify sectors with the strongest linkages across the whole economy as those which are simultaneously forward and backward oriented.

The analysis also makes a distinction between sectors whose inter-linkages are spread over many sectors in the economy and sectors whose inter-linkages are concentrated in a few sectors. As suggested by Boucher (1976), this can be measured by the coefficient of variation which is simply the standard deviation divided by the mean. The backward coefficient of variation is thus given by

$$COV_B = \frac{\sqrt{\left(\frac{1}{n-1}\right)\sum_i \left(TR_{ij} - \frac{1}{n}\sum_i TR_{ij}\right)^2}}{\frac{1}{n}\sum_i TR_{ij}} \tag{15}$$

and the forward coefficient of variation is given by

$$COV_F = \frac{\sqrt{\left(\frac{1}{n-1}\right)\sum_j \left(TO_{ij} - \frac{1}{n}\sum_j To_{ij}\right)^2}}{\frac{1}{n}\sum_j TO_{ij}} \tag{16}$$

A low coefficient of variation in a particular sector indicates that investment in that sector would stimulate all domestic sectors in the economy relatively evenly. On the other hand, a high coefficient of variation means that the stimulus generated by investment in a particular sector is unevenly shared amongst all sectors. Therefore any given sector's importance in the economy is greater if the estimated linkage is relatively large and the coefficient of variation relatively small.

Table 4. Backward and Forward Linkages

	Backward		Forward	
	Linkage	Coeff. of variation	Linkage	Coeff. of variation
Agriculture	1.02	2.25	0.99	2.20
Manufacturing	0.92	2.50	0.88	2.91
Electricity, gas and water supply	0.98	2.30	1.40	1.45
Construction	1.01	2.22	0.84	2.63
Commerce*	1.04	2.41	0.93	2.35
Transport and communication	0.91	2.57	1.04	2.17
Financial services	0.97	2.39	1.33	1.66
Business services	0.94	2.70	1.05	2.15
Public Administration	0.95	2.38	0.75	2.87
Other services**	1.27	1.93	0.79	2.87

*Includes wholesale and retail trade, hotels and restaurants.

**Includes education, health, cultural and gaming activities.

The results presented in Table 4 show that the electricity, gas and water supply sector and the financial services sector had the highest forward linkages and lowest coefficients of variation, suggesting that the two sectors play a key role in providing inputs to all domestic sectors in the economy. In continuation with the previous example, this would mean that higher prices charged by the electricity sector would probably result in higher costs to most other sectors in the economy.

The estimates also show that the backward linkages are highest in the other services sector, indicating that the sector is highly dependent upon other domestic sectors for its input requirements. The desirability for high backward linkages stems from the increase in other sectors' output to meet the demand generated by a sector's intermediate input requirements. At the same time, backward linkages were lowest in the transport and communications sector. The similar results observed for output multipliers in section 3 come as no surprise as the backward linkages *à la* Yotopoulos and Nugent (1976) are proportional to the output multiplier estimates.

5. Limitations

The analysis presented in sections 3 and 4 demonstrates the usefulness and practical implications of input-output modelling. However, a comprehensive understanding of the informational value-added gained through input-output analysis necessitates that one also understands its limitations. While some are subject to the modelling choices of the analyst, others are implicit in the static input-output model developed by Leontief.

First, multipliers focus on the demand-side of the economy. They ignore the supply-side and capacity constraints, and are thus short run in nature. Indeed, they might be thought of in the tradition of Keynesian macroeconomics. In practice, this means that following an increase in demand, the Leontief multiplier may predict increases in output which violate the supply constraints of the economy. A second and equally 'restrictive' assumption is that the Leontief multiplier is based on a fixed price assumption. In practice, however, the reallocation of resources resulting

from shocks to the economy has implications for both demand and supply-sides of the economy, thereby distorting commodity prices and returns to factors of production. To overcome both these deficiencies the analysis would require a general equilibrium approach capturing the supply and demand relationships between all interconnected sectors in the economy, with prices providing the common flow of information needed to coordinate the system. If this were the case, the model is likely to predict lower sector impacts, implying that the input-output model might overestimate the "true" impact following some shock in final demand.

Third, the input-output applications assume that there are no economies of scale. This means that the proportion of inputs used in a particular sector's production process do not change regardless of the level of production. This limitation would be particularly significant if there are significant changes in final demand.

Fourth, while the table has been constructed at the highly disaggregated level of sixty industries and ninety-two products, for the purposes of this paper it is aggregated to ten sectors. Through aggregation and alteration of sector definitions the relative importance of sectors might change significantly. Furthermore, a high level of aggregation may itself lead to some inaccurate conclusions because it changes input and output coefficients, and thereby affects the estimated impact of a particular sector on the economy.

Despite these limitations, input-output modelling remains one of the most accepted means of estimating sectoral impacts. Whilst it is true that economic modelling has come a long way since the first applications of input-output modelling, this type of analysis still offers a unique contribution through its ability to shed light on issues of sectoral economic impacts and the identification of key sectors in the economy. Furthermore, because input-output tables provide a system that incorporates the various sectors of the economy in a form coherent with economic theory, they still play a critical role in the formulation of larger scale models such as social accounting matrices, macro-econometric models as well as the increasingly popular computable general equilibrium models (Dervis, de Melo and Robinson, 1982).

6. Policy-relevant Conclusions

The study provides an overview of the fundamental principles of input-output theory, the steps involved in linkage analysis and the estimation of industry multipliers. These have been estimated using a 'new' symmetric input-output table for the Maltese economy for 2007. It differs from previous input-output tables for Malta which focused on the production side of the economy and ignored important aspects of the services sector. Constructed in line with the requirements set forth by the European Commission's statistical arm, Eurostat, the estimates should also serve as a benchmark for all input-output tables to be constructed for the Maltese economy in the future. In addition, the estimated industry multipliers may be an important input into the decision making process for Maltese policymakers. More generally, the study makes five major policy-relevant conclusions.

First, in line with standard input-output analysis, it shows that the effect of any increase in final demand will go beyond the industry directly affected by the increase in expenditure. This is because the directly affected industry turns to other industries for inputs in order to meet the increase in demand.

Second, although individual industry multipliers are indicative of the extent of a sector's linkages with other industries and institutions in the economy, it need not necessarily imply that the greatest contributions to a country's economy are from those industries with larger multipliers. Indeed, it would be naïve to play down the contribution of a relatively large sector because of its relatively small multiplier. However, it would be correct to say that investment in a sector with a relatively large multiplier (or equivalently a high backward linkage) would generate a greater contribution to the economy than an equal sum invested in a sector with a lower value added multiplier. Thus, industry multipliers provide a significant guide to policy makers in small open economies that are particularly concerned with making optimal use of their scarce resources.

Third, irrespective of the impact on GDP, the analysis shows that employment and income multipliers will be greater for expenditures on labour intensive industries. This direct relation is due to the significant leakages from small open economies. In fact, there is probably less of a direct relationship in larger economies that have larger multipliers. Governments vying for policies that tilt the balance in favour of the worker (or vice versa) should find this particularly informative especially if their economies depend significantly on foreign direct investment.

Fourth, multiplier analysis also shows that an increase in final demand yields an increase in GDP which is less than the initial change in expenditure. To a large extent, this result is due to the high dependence of the Maltese economy on imported products to provide the necessary inputs in the production process. This has important implications for the role of fiscal policy in small open economies and goes a long way in justifying the firm-specific targeted approach adopted by governments of small open economies when their economies are in distress.

Fifth, the study led to the identification of sectors which are an important source of supply. The identification of these strategic sectors goes beyond the simple analysis of sectoral shares in the economy's total output, but is based on careful analysis of the inputs and outputs of each industry, including potential indirect effects that may be initiated following a change in final demand. The results show that the electricity, gas and water supply sector and the financial services sector had the highest forward linkages and lowest coefficients of variation, suggesting that the two sectors play a key role in providing inputs to a large number of domestic sectors in the economy. The policy-relevance of this point stems from the fact that inefficiencies and market distortions would be more damaging in those sectors that provide a key input to other industries and institutions.

Finally, the estimated multipliers provide a benchmark for alternative estimates which overcome the input-output model's fixed price assumption, such as those deriving from computable general equilibrium analysis. On the downside, this type of analysis would prove more informative to policy makers if it were conducted at a more disaggregated level such that it captures better the specificities of individual industries in the Maltese economy.

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Notes

Note 1. The sector includes sub-sectors such as health, education and recreational activities (including i-gaming).

Note 2. Fixed product sales structure assumes that each product has its own specific sales structure, irrespective of the industry where it is produced.

Note 3. Value added multipliers relate to both wages and profits whereas income multipliers relate only to wages.

Investments in Land Conservation in the Ethiopian Highlands: A Household Plot-level Analysis of the Roles of Poverty, Tenure Security, and Market Incentives

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Abstract

Land degradation is a major problem undermining land productivity in the highlands of Ethiopia. This paper analyses the decisions made by individual household to adopt and intensify land conservation investment. The paper used a Box-Cox Double Hurdle specification and offers the advantage of exploiting panel data collected in a household survey of 6,408 plots in Ethiopia. The results suggest that adoption and intensification decisions appear to be explained by different processes, justifying the use of Box-Cox double hurdle approach over more restrictive models. Poverty-related factors seem to have mixed effect on both adoption and intensification decisions. While farmer's adoption decision is affected by expectation of the certainty of cultivating the land for the next five years (risk for long term), intensification of land conservation investment is determined by whether or not the plot is owner-operated (risk for immediate period) and plot-home distance. A lesson for policymakers is that major changes in land conservation investments will require attention to many factors because no single factor can be used as a major policy leverage instrument. Some of these factors (such as land tenure security, plot size, and total farm holdings) can be directly influenced by government policies and programs.

Keywords: Ethiopia, land conservation, markets, poverty, tenure security, Box-Cox double hurdle model

JEL classification: D1, Q12

1. Introduction

A critical environmental issue facing governments of developing societies is land degradation, which is crucial, among other things, to the well-being of their people. Hurni, 1985, noted well over 20 years ago that Ethiopia was the most environmentally troubled country in the Sahel belt. Studies of land degradation in Ethiopia have confirmed that it undermines agricultural productivity primarily in the highlands, where most (88%) of the country's population lives, and accounts for more than 43 percent of the country's area, 95% of the cultivated land, and 75% of the livestock. Estimates of the extent of land degradation differ, but all indicate the importance of the problem. The Ethiopian Highland Reclamation Study (EHRS) estimated that by the mid-1980s about 50% of the highlands (27 million hectares) was significantly eroded, while more than one-fourth was seriously eroded (EHRS, 1986, cited in Gebremedhin and Swinton, 2003). Hurni, 1988, found that soil loss in cultivated areas averaged about 42 metric tons per hectare per year, far exceeding the soil formation rate of 3–7 metric tons per hectare per year. Stahl, 1990, estimated that the amount of land incapable of supporting cultivation would reach 10 million hectares by the year 2010.

The magnitude of land degradation (and deforestation) by far exceeds the conservation activities being carried out (Note 1). Indeed, it is only recently that public intervention in land conservation has become an important priority in

Ethiopia (Federal Democratic Republic of Ethiopia Rural Land Administration and Land Use Proclamation No. 456/2005). Land degradation was largely neglected by policymakers until the 1970s and national conservation programs introduced since then have been guided by little prior research (Shiferaw and Holden, 1999). Policies and programs were adopted based on incorrect assumptions and little understanding of the incentives and constraints related to land conservation - which could be misleading.

Better knowledge about what criteria households use in their decisions to invest in land conservation will improve policymakers' ability to design effective programs that promote such land conservation investments. This study looks into factors affecting farm households' private decisions to invest in land conservation and how much to invest by focusing on the roles of poverty-related factors, land tenure security, and market access.

The effects of these sets of variables on land conservation decision and level of conservation are not clear from the literature. For example, an inverse relationship between poverty (in its different forms) and a household's decision to invest in land conservation and at what intensity is substantiated in various studies (Holden, et al., 1998; Godoy, et al., 2001; Clay, et al., 2002; Holden and Shiferaw, 2002; Gebremedhin and Swinton, 2003; Hagos and Holden, 2006). On the other hand, it is also argued in the literature that risk aversion may enhance technology adoption if the technology reduces the risk to household income, suggesting that poverty may positively influence land conservation investment. Similarly, there are studies which argued that more secure land tenure encourages land conservation investment (Feder, et al., 1988; Rahmato, 1992; Alemu, 1999; Joireman, 2001; Gebremedhin and Swinton, 2003), while others found either weak or unclear effects of land tenure security on land conservation investment (Sjaastad and Bromley, 1997; Place and Migot-Adholla, 1998; Brasselle, et al., 2002; and Holden and Yohannes, 2002).

This study makes a number of contributions to the existing literature on land conservation. Its main contributions are related to the empirical application of a model of landowner decision-making to a panel dataset that enables investigation of several relevant aspects of the problem. In particular, using a panel of a vast data and the Box-Cox double hurdle model, together with extra explanatory variables is what this study offers in comparison with the previous literature. We used household plot-level panel data collected in household surveys in the years 2002 and 2005 from the Amhara region of Ethiopia. Unlike most other studies that have analyzed land conservation, the use of panel data enabled us to use lagged values of some of the explanatory variables, which helped resolve issues of endogeneity. At the same time, it gave us the chance to consider the effect of past values of variables on current decisions. The richness of the data on land conservation also allowed us analyze not only the determinants of adoption but also the level of investment in land conservation. Moreover, unlike most other studies (Note 2), and partly because of the availability of data on the level of investment, we also used Box-Cox double-hurdle model in our analysis, which helps identify whether the determinants of adoption are different from those of the level of investment in land conservation. Finally, compared with other studies on the topic, we incorporated a wider range of variables, including asset- and poverty-related factors as possible determinants of the decision to adopt and intensify land conservation investment.

The rest of the paper is structured as follows. The conceptual framework we use is presented in section 2. Section 3 presents the empirical strategy we follow. Data, results, and interpretation are presented in section 4, while section 5 summarizes and concludes.

2. Conceptual Framework

A farm household's expenditure on land conservation practices and input uses can consume a significant share of its overall expenditure. Use of land conservation practices and inputs, therefore, are considered to be major investment decisions by farmers as they forego other opportunities. For Clay, et al., 2002, farmers are likely to pose two basic questions before making land conservation investment and/or using land inputs: 1) will investment in land conservation and/or input use be profitable, and 2) can they afford it? Thus, factors that influence profitability can be thought of as the "incentives" to adopt land conservation practice and input uses. On the other hand, whether farmers can afford to invest in land conservation depends on their capacity to carry out land conservation investment.

Ideally, factors that affect profitability of investment in conservation practices and inputs include access to market, crop and input prices, cost of labor and materials used for conservation, prevailing wages for agricultural and non-agricultural activities, and yield effect of land conservation practices (Clay, et al., 2002; Gebremedhin and Swinton, 2003). In relation to access to market, output prices are expected to affect land investment through the incentive they can create to plant soil-conserving crops versus more erosive crops. We used site (i.e. 'Kebele' or Village) (Note 3) dummies to account for differences in prices across villages or sites. Moreover, as is common in rural Ethiopia, since much of the production is consumed by the household and markets are missing, thin or

imperfect, we can assume in our model that farmers also use criteria other than market prices to evaluate returns from land conservation investments. We can, therefore, model household conservation investment under imperfect factor markets (Udry, 1996; Holden, et al., 2001). This implies that households' production and investment decisions may not be dictated by profit considerations alone, but consumption choices as well.

In such settings where markets do not fully function or are entirely missing, other factors, such as household poverty-related characteristics and land tenure security, can play a critical role in influencing the decision and intensity of land conservation investments. Physical incentive factors (that include farm and plot characteristics) can also affect profitability of investment in land conservation practices and inputs. A farm household's capacity to carry out land conservation practices and inputs improves as the farmer gets richer, when financial capital increases and when levels of human and social capital are higher. Financial capital, which includes cash income and/or credit, and non-liquid assets, permits farmers to invest more, while human capital, such as education and labor input, enables farmers to use land conservation more efficiently.

Consideration of the risk of making land conservation investments and input uses by farmers can also alter their capacity to do so. For Feder, et al., 1985, these risks fell into two categories: risks affecting "confidence in the short term" (such as from price or rainfall instability), and risks affecting "confidence in the long term" (such as insecure land tenure). This study focuses on the latter. The effect of farmers' risk associated with *insecure land tenure* on their decision to make land conservation investment is relevant in Ethiopia where land is state-owned and the farmer has only use right .

Swinton and Quiroz, 2003, formally modeled the question as to which factors govern a household's choice to adopt and intensify a particular farming practice. For them, such a microeconomic decision emerged from the household's attempt to optimize its perceived welfare, subject to limitations imposed by the available economic and natural resources, as well as the parameters imposed by the larger economy. This household's problem can be modeled as:

$$\left.\begin{array}{ll} \underset{x}{Maximize} & U(c, y^c) \\ Subject\ to & y = y\ (L_a, x/k, z) \\ & P_c\, c \le p_y(y - y^c) - p_x x - p_{ah} L_{ah} + p_{\ln} L_n \\ & L = L_{af} + L_n \end{array}\right\} \quad (1)$$

Equation(1) states that "the farm household chooses the agricultural practices x that will maximize the household's utility from consuming marketed consumption-good c and home-produced good y in quantity y^c, subject to the technology for producing good y, household budget, and availability of labor. In terms of technology, the maximization is constrained by technology for producing good y on the farm, which depends on agricultural labor (L_a) and agricultural practices (x), and is conditioned by farm-level capital (k, in various forms) and other natural and external economic characteristics (z). The budget constraint states that no more of c can be purchased at price p_c than the household can afford with net income from sales of y after subtracting home consumption (y^c), the cost of production practices ($p_x x$), and the cost of hired farm labor ($p_{ah} L_{ah}$), plus income from non-farm employment ($p_{ln} L_n$). Finally, the labor available for own-farm production work (L_a) must either come from the family (L_{af}) or from hired labor (L_{ah}). And family labor may be devoted either to own-farm agricultural work (L_{af}) or to non-farm work (L_n).

The solution to this constrained optimization problem yields a reduced form input demand equation (equation (2)) for farming practices x_{ji} (the specific practice x_j associated with the state of natural resource (i)) that depends on the prices (p) of output y, inputs x, labor L_a and L_n; the levels of other agricultural practices $x_{(j)}$ other than x_j; farm capital or asset (k); and conditioning factors (z) related to economic infrastructure, natural characteristics, and the household's management knowledge and information".

$$x_{ji} = x_j(p,\ x_{(j)},\ k,\ z) \quad (2)$$

Equation (2) seeks to answer what matters in the choice of land conservation or farming practices. For instance, do poverty-related factors, such as asset levels, matter in determining the choice of farming practices? If so, which assets matter most - land, livestock, household labor, human capital (education), and/or social capital?

Following Reardon and Vosti, 1995, the categories of poverty or assets in our analysis go beyond the conventional accounting definition of "assets". In this model, the definition of capital assets (k) measures assets as physical and financial (including income, land, livestock, equipment, buildings, financial assets, and other inventories with

marketable value (such as the value of live trees)). On the other hand, the value of people as a key productive asset depends on their number (as measured by household size) and their quality (as measured by age and education). Social capital is also an additional asset category worth considering in the model. This is because social capital may allow a community to impose social norms to discourage individual behavior that undermines the long-term interests of the community as a whole. Moreover, the degree to which people in a community care about one another may ameliorate other conventional resource constraints, such as market access or credit limitations. The *z* variable can broadly account for institutional settings, such as market incentives and land tenure security.

3. Empirical Strategy

In this section, we present a general empirical model of farm investment on land conservation practices set in a way that reflects the conceptual framework summarized above. The selection of explanatory variables we used is based on various related empirical works (e.g., Clay, et al., 2002; Gebremedhin and Swinton, 2003; Hagos and Holden, 2006; Kabubo-Mariara, 2007) and theoretical literature on farm-level investment (e.g., Christensen, 1989; Feder, et al., 1992; and Feder, et al., 1985). In view of this, investment in land conservation is viewed as a function of six vectors of variables (poverty-related factors, land tenure security, market access, physical incentives or plot characteristics, alternative land conservation practices, and village dummies).

3.1 General Empirical Model

The general form of the empirical model we used is given by equation (3):

$$I_{tij} = \beta_0 + (\text{Poverty}_{t\text{-}1i})\beta_1 + (\text{Tenure}_{tij})\beta_2 + (\text{Market}_{ti})\beta_3 + (\text{Plot}_{tj})\beta_4 + (\text{CV})\beta_5 + \varepsilon, \quad (3)$$

where I_{tij} represents the level of land conservation investment made by the farm household *i* on plot *j*, as measured by the length of land conservation structure (Note 4) per hectare (Note 5) over the last 12 months (i.e., over the t-time period); β_0 represents the constant term; and the vector $Poverty_{t\text{-}1i}$ includes measures of income and asset levels of the farm household *i* over the year prior to the last 12 months (i.e., over the t-1 – time period). We assumed that initial poverty-related constraints would matter in the farm household's decision to invest in land conservation. Thus, we considered lagged values of the cash income and non-liquid asset variables. Such initial wealth conditions enable examination of the effect of time recursive causality of initial wealth characteristics on land conservation investments (Hagos and Holden, 2006). The vector $Tenure_{tij}$ represents variables measuring degree of tenure security by the farm household *i* on plot *j* over the t-time period. The vector $Market_{ti}$ is related to market access variables associated with farm household *i* over the t-time period. The vector $Plot_{tj}$ represents variables measuring physical characteristics pertinent to plot *j* of farm household *i* over the t-time period. β_1, β_2, β_3, β_4, *and* β_5 are each a vector of parameters corresponding to each vector of variables$_j$. We also included other control variables (CV). These consist of intensity of alternative land conservation practices and village dummies. ε represents the error term.

As highlighted above, we modeled adoption and intensity of land conservation investment at the plot rather than at the household level. Thus, the model design takes into account that land conservation adoption and intensity decisions are not made uniformly for the entire farm of the household. Unlike most other studies that analyze land conservation, we used a broader set of variables needed to understand the farm management and household strategy seen in such investments. Due to the panel nature of the data used in this study (associated with multiple plot-level observations for each household), we attempted to correct the standard errors for clustering at the household level.

3.2 Issues in Model Selection

In principle, the decisions whether to adopt investment in land conservation and input practices, and how much to invest (intensity of investment), can be made jointly or separately. It can be argued that adoption and intensity of use decisions are not necessarily made jointly (Gebremedhin and Swinton, 2003). The decision to adopt may precede the decision on the intensity of use, and the factors affecting each decision may be different. Had it been the case that the two decisions were made jointly (see Sureshwaran, et al., 1996; Pender and Kerr, 1998) and that these decisions were affected by the same set of factors, then the Tobit model would be appropriate for analyzing the factors affecting the joint decision (Greene, 2000).

However, neither straightforward binary nor censored data models may help in a case where factors affecting each decision are different (Moffatt, 2005).

In the case where the decision whether to adopt the land conservation investment and the decision about how much of it to adopt are not jointly made, it is more suitable to apply a "double-hurdle" model, in which a probit regression on adoption is followed by a truncated regression on the non-zero observations (Cragg, 1971) (Note 6).

The double-hurdle model has rarely been used in the area of adoption and intensity of land conservation investments and input uses. An exception we know of is Gebremedhin and Swinton, 2003, who applied it to examine northern Ethiopian farmers' reasons (focusing on land tenure security and public programs) for adopting and intensifying soil

conservation measures (stone terraces and soil bunds). The double-hurdle specification, however, assumes that the error terms are normally and independently distributed, and in case the normality assumption does not hold estimates will be inconsistent. A solution to this problem is to use a Box-Cox double hurdle specification.

3.3 The Hurdle Model and Its Variants

In cases where the dependent variable takes only positive values and a large proportion of zeroes (which is the case in this study where 84% of observations have zero values), ordinary least squares (OLS) econometric techniques are biased (Long, et al., 2006). An alternative is to estimate the Tobit model, which also has a number of potential shortcomings due to the restrictive assumptions it makes (Blundell and Meghir, 1987). In particular, it assumes that all zero observations are, in fact, standard corner solutions and those households who do not adopt do so as a result of their economic circumstances. This is incongruent to our study because it is possible that some farm households would never state a positive amount as a matter of principle (Note 7) or because they consider land conservation investment or input use as a bad. The p-Tobit model has also been proposed as an alternative, but this is generalized by the use of the double-hurdle model.

The double-hurdle model is a parametric generalization of the Tobit model (Martínez-Espiñeira, 2006) that introduces an additional hurdle which must be passed for positive observations to be observed. As the name "double-hurdle" suggests, farm households must scale two hurdles in order to invest in land conservation. There may be farmers who do not adopt, and hence fall at the first hurdle, and others who pass the first hurdle. The first decision or hurdle for farm households in our setting is whether they will make any land conservation investment at all, while their second decision is the level of land conservation investment, conditional on their first decision.

In the double-hurdle model, both hurdles have equations associated with them, incorporating the effects of adopter characteristics and circumstances. An explanatory variable may appear in both equations or in either of them, and a variable appearing in both equations may have opposite effects in the two equations. The double-hurdle model contains two equations - the adoption equation and the equation on level of adoption (Moffatt, 2005):

$$\begin{aligned} d_i^* &= z_i'\alpha + \varepsilon_i \\ y_i^{**} &= x_i'\beta + u_i \\ \begin{pmatrix} \varepsilon_i \\ u_i \end{pmatrix} &\sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & \sigma^2 \end{pmatrix}\right] \end{aligned} \tag{4}$$

where d^* is a latent adoption variable that takes the value 1 if the household adopted land conservation investment, and 0 otherwise; z is a vector of explanatory variables; and α is a vector of parameters. y represents intensity of adoption and x is a vector of explanatory variables, and β is a vector of parameters.

The first hurdle is then represented by:

$$\begin{aligned} d_i &= 1 \quad if \quad d_i^* > 0 \\ d_i &= 0 \quad if \quad d_i^* \le 0 \quad . \end{aligned} \tag{5}$$

The second hurdle is given by:

$$y_i^* = \max\left(y_i^{**}, 0\right) \quad . \tag{6}$$

And the observed variable, y_i, is finally determined by equation (7):

$$y_i = d_i y_i^* \quad . \tag{7}$$

The log-likelihood function for the double hurdle model is:

$$LogL = \sum_0 \ln\left[1 - \Phi\left(z_i'\alpha\right)\Phi\left(\frac{x_i'\beta}{\sigma}\right)\right] + \sum_+ \ln\left[\Phi\left(z_i'\alpha\right)\frac{1}{\sigma}\phi\left(\frac{y_i - x_i'\beta}{\sigma}\right)\right] \tag{8}$$

The double-hurdle model (as originally proposed by Cragg, 1971) is equivalent to a combination of a truncated regression model and a univariate probit model, provided the assumption of independence between the error terms ε_i and u_i, stated in equation (4), holds. Following Cragg, 1971, the decision on adoption can be modeled as a probit regression (Gebremedhin and Swinton, 2003):

$$f(y = 1 | X_1, X_2) = C(X_1'\beta), \tag{9}$$

where C(.) is the normal cumulative distribution function, and X_1 and X_2 are vectors of independent variables, not necessarily distinct. The decision on the intensity of use can be modeled as a regression truncated at zero:

$$f(y | X_1, X_2) = (2\pi)^{-1/2}\sigma^{-1}\exp\left\{\frac{-(y - X_2'\gamma)^2}{2\sigma^2}\right\} \times \frac{C(X_1'\beta)}{C(X_2'\gamma/\sigma)} \tag{10}$$

3.4 Box-Cox Double Hurdle Model

As shown in the last expression of equation (4), the two error terms (ε_i and u_i) in the double hurdle specification are assumed to be normally and independently (Note 8) distributed. In case the normality assumption does not hold the maximum likelihood estimate will be inconsistent. A solution to this problem is to transform the dependent and latent variable. This can be done by manipulating the dependent variable, Y, using a Box-Cox transformation (Jones and Yen, 2000; Moffatt, 2005; Martínez-Espiñeira, 2006):

$$y^T = \frac{y^\lambda - 1}{\lambda}, \quad 0 < \lambda \le 1 \tag{11}$$

where $\lambda = 1$ and $\lambda \to 0$ represent special cases of straightforward linear transformation and the logarithmic transformation respectively. Normally, λ would be expected to be somewhere between these two extremes. The Box-Cox double hurdle is obtained by applying the transformation on the dependent variable in the double hurdle model (equations 6 and 7), and defining the hurdles as (Moffatt, 2005):

First hurdle:

$$\begin{aligned} d_i &= 1 \quad if \quad d_i^* > 0 \\ d_i &= 0 \quad if \quad d_i^* \le 0 \end{aligned} \tag{12}$$

Second hurdle:

$$y_i^{*T} = \max(y_i^{**T}, -\frac{1}{\lambda}) \tag{13}$$

Observed variable, y^T, is finally determined by:

$$\begin{aligned} y_i^T &= y_i^{*T} \quad if\ d_i = 1 \\ y_i^T &= -\frac{1}{\lambda} \quad if\ d_i = 0 \end{aligned} \tag{14}$$

The log-likelihood function for the Box-Cox double hurdle model is:

$$LogL = \sum_0 \ln\left[1 - \Phi\left(z_i'\alpha\right)\Phi\left(\frac{x_i'\beta + 1/\lambda}{\sigma}\right)\right] + \sum_+ \ln\left[\Phi\left(z_i'\alpha\right) y_i^{\lambda-1} \frac{1}{\sigma}\phi\left(\frac{y_i^T - x_i'\beta}{\sigma}\right)\right] \tag{15}$$

which is similar to equation (8) except that in equation (15) y^T is used instead of y which requires a Jacobian term $y^{\lambda-1}$ to be included.

In this study, we estimated both the Box-Cox double-hurdle and Box-Cox tobit models and select the appropriate one (see section 4.2). We used the econometric software STATA (version 11).

3.5 Heteroskedasticity and Panel Effect

We attempted to control for the panel nature of the data (multiple plot-level observations for each household) using clustering in STATA. The regressions were analyzed using robust estimators to account for clustering within households.

3.6 Exogeneity of RHS Variables

Some of the exogenous variables seem to be jointly determined with the land conservation decision and may appear endogenous. Thus, we considered lagged values of the suspected variables such as poverty and wealth related

variables. This enables examination of the effect of time recursive causality of initial characteristics on land conservation investments.

3.7 Test for Model Appropriateness: Box-Cox Tobit versus Box-Cox Double-Hurdle Model

Whether a Box-Cox tobit or a Box-Cox double hurdle model is more appropriate can be determined by separately estimating the Box-Cox tobit and the Box-Cox double hurdle models and then conducting a likelihood ratio test that compares their log likelihood functions. The likelihood ratio test statistics is computed and decisions are made (see section 4.2) following the literature (Greene, 2000).

4. Data, Results, and Interpretation

The main data source for this study was rural household survey collected in East Gojjam and South Wello zones of the Amhara region of Ethiopia. We use panel data that was collected in 2002 and 2005 as part of a collaborative research project by the economics departments at Addis Ababa University, Ethiopia, and University of Gothenburg, Sweden, with financial support from Sida/SAREC.

4.1 Data and Descriptive Statistics

A total of 1,520 households from 12 sites (villages or *kebeles*), with a minimum of 120 households from each site, were interviewed in the 2002 round of the survey. Two more sites (i.e., 240 households) and some new questions were included in the 2005 round. This made a total of 1,760 households in 14 sites interviewed in the 2005 round. The selection of the sites was deliberate to ensure variation in the characteristics of the sites, including agro-ecology and vegetative cover. Households from each site were then selected using simple random sampling.

Some of the variables of interest to this study were not included in the 2002 round, so this study focused mainly on analyzing the data gathered in the 2005 round and included poverty- and asset-related variables from the 2002 round. The regression analysis in this study used 6,408 household plots, after dropping the remaining plots due to missing values. The data gathered a host of household-related variables, as well as plot-level data, including land conservation practices and inputs, and questions pertaining to household poverty, land tenure security, and market incentives.

Table 1 presents the definitions and observation level of the variables included in the analysis. The dependent variable in the first hurdle is the farm households' adoption decision of land conservation investment on specific plots. The level of land conservation or intensity of investment in land conservation is also used as another dependent variable in the second hurdle. The rest of the variables listed in table 1 are explanatory variables. Following the conceptual framework and the related discussion earlier in this paper, we classified the variables used in the analysis into six broad categories (Note 9): poverty-related factors (Note 10), risk or land tenure security (Note 11), market access, physical incentives, alternative input uses, and village dummies.

Table 1. Definition and observation level of the dependent and explanatory variables

Variables			Definition	Obs. Level
Land conservation adoption (Dependent variable /DV/)			Implemented new soil conservation works in the past12 months: 1 if implemented; 0 if otherwise	Plot
Level of land conservation (DV)			Length of land conservation investments in the last 12 months: Meter/Hectare	Plot
Poverty-related factors	Income	Non-crop income	Sale of livestock and its products, energy, trees, and gift: ETB/year	Household
		Employment income	Income from non-own agricultural employment: ETB / year	Household
		Cash crop income	Income from sale of production: ETB / year	Household
		Access to credit*	Household had access to credit over 200 ETB per year: 1 if yes; 0 if no	Household
	Non-liquid asset	Farm size	Total land holding by the household in current year : Hectare	Household
		Number of cattle	Number of cattle owned by the household	Household
		Number of ruminants	Number of ruminants owned by the household	Household
		Value of livestock	Monetary value of livestock owned if sold: ETB / year	Household
		Value of live trees	Monetary value of live trees owned if sold: ETB / year	Household
		Value of crop produced	Market value of crop output produced if sold: ETB / year	Household
	Human-capital	Male adults per hectare	Number of male adults of age between 12 and 65 per Hectare	Household
		Female adults per hectare	Number of female adults of age between 12 and 65 per Hectare	Household
		Dependent ratio	Ratio of number of non-working to working age-members of age 12 -65	Household
		Age of household head	Age of head of the household: number of years	Household
		Male head of household	Gender of head of the household: 1 if male and 0 if female	Household
		Literacy of head	Literacy of head of the household: 1 if read /write; 0 otherwise	Household
		Marital status of head	Marital status of head of the household: 1 if married; 0 otherwise	Household
		Access to extension	Household access to extension services: 1 if has access; 0 if no	Household
		Soil conservation advise	Development agents advised household on soil conservation: 1 if advised; 0 if not.	Household
	Life improvements: Social capital		Household's belief in life condition improvement in the future: 1=definitely possible, 2=possible, 3=not sure, 4=impossible, 5=completely impossible	Household
	Household expenditure		Household expenditure per annum: ETB	Household
Land tenure security – risk factor	Cultivate plot in 5 years		Plot owners feels certain to cultivate the plot 5 years from now:1 if certain; 0 if not	Plot
	Land ownership type		Type of land ownership: 1 if owner-operated; 0 if otherwise (mortgage/rent –in or out)	Plot
	Land ownership belief		Household believes that land belongs to itself 1; 0 otherwise[i]	Household
	Plot-home distance		Distance of plot from residence: walking minutes	Plot
	Simpson Index: Index of land fragmentation		1 minus the ratio of the sum of squared plot areas to the squared area of the total farm size of the household: plot fragmentation index	Household
	Plot age		Number of years since land was held by the household	Plot
Market access	Town-residence distance		Distance of household residence to nearest town: walking minutes	Household
	Road-residence distance		Distance of residence to nearest car road: walking minutes	Household
	Market-residence distance		Distance of residence to market most products sold: walking minutes	Household
	Return from investment		Proxy by household expectation of long term effect of fertilizer: 1 if decreases or no change to productivity; 0 if increases productivity	Household
Physical incentives	Highland		Plot altitude from sea level: 1 if above 2500m; 0 otherwise	Plot
	Soil fertility		Fertility of the plot's soil: 3 if fertile, 2 if medium, 1 if low fertility	Plot
	Plot slope		Slope of the plot: 1if steep uphill /'dagetama'; 0 otherwise	Plot
	Plot area		Plot area in Hectare	Plot
	Plot access to irrigation		Plot has access to irrigation: 1 if irrigated; 0 if not irrigated	Plot
	Major use of plot[ii]	Tree plant	Major use of the plot is for tree planting: 1 if yes; 0 otherwise	Plot
		Grazing	Major use of the plot is for grazing : 1 if yes; 0 otherwise	Plot
Input	Past land investment intensity		Length of land conservation investments before the last 12 months: Meter	Plot
	Modern fertilizer use		Modern fertilizer used over the last 12 months: Kilogram	Plot
	Natural fertilizer use		Natural fertilizer use over the last 12 months: Kilogram	Plot
Village Dummy[iii]	Amanuel D.Elias		1 if village is Amanuel; 0 otherwise 1 if village is D.Elias; 0 otherwise	Prefecture
	Kebi Telma		1 if village is Kebi; 0 otherwise 1 if village is Telma; 0 otherwise	Prefecture
	Yamed Wolkie		1 if village is Yamed; 0 otherwise 1 if village is Wolkie; 0 otherwise	Prefecture
	Sekladebir		1 if village is Sekladebir; 0 otherwise	Prefecture

*In this study, credit access is considered as part of household's cash income. Assessment of the data resulted in 200 ETB as a cut-off point for access to credit

.[i]Zero is when household believes the land belongs to either the peasant association or the government. [ii] The base group for the major use of plot dummy is 'plot with major use for farming and/or fallowing'. [iii] The base group for the village dummies include villages named 'Kete', 'Godguadit', 'Ambamariam', 'Addismender', 'Chorisa', 'Indodber', and 'Addisgulit'

Table 2 provides summary statistics for all the dependent and explanatory variables used in our analysis for the full sample, non-adopters, and adopters of land conservation investment. Land conservation adoption is undertaken on about 16 percent of the plots. The mean length of land conservation structure on a plot is 42 and 268 meters per hectare for the full sample and the adopting plots, respectively. This is far less than the average requirement of 700 meters per hectare of stone terraces or soil bunds to conserve a hectare of land and reduce soil erosion effectively on typical sloped areas in northern Ethiopia as estimated by Gebremedhin and Swinton, 2003.

Table 2. Summary statistics for full sample, adopters and non-adopters of land conservation investment

Variables			Full sample (N = 6408)		Adopting (N = 1005)		Non-adopting (N = 5403)	
			Mean	**Std.Dev**	**Mean**	**Std.Dev**	**Mean**	**Std.Dev**
Land conservation adoption			0.16	0.36	1	0	**0**	**0**
Level of land conservation (m per ha.)			42	147	268	277	-	-
Poverty-related factors	Income	Non-crop income	512	594	478	518	518	606
		Employment income	139	368	102	279	146	382
		Cash crop income	204	305	187	253	208	314
		Access to credit	.19	.39	.18	.38	.20	.40
	Non-liquid asset	Farm size	1.61	1.22	1.49	1.12	1.63	1.24
		Number of cattle	4.15	3.69	3.58	2.84	4.25	3.82
		Number of ruminants	1.77	3.10	1.68	2.89	1.79	3.14
		Value of livestock	1809	1568	1623	1343	1844	1604
		Value of live trees	2249	4405	2665	5092	2172	4261
		Value of crop produced	893	1192	900	1308	892	1169
	Human-capital	Male adults per hectare	2.16	1.91	2.22	2	2.15	2
		Female adults per ha.	2.18	2.11	2.0	1.85	2.18	2.16
		Dependent ratio	.65	.55	.62	.48	.66	.56
		Age of household head	50	15	50	15	50	14.39
		Male head of household	.88	.32	.88	.33	.88	.32
		Literacy of head	.51	.50	.45	.50	.52	.50
		Marital status of head	.88	.32	.85	.36	.89	.32
		Access to extension	.51	.50	.59	.49	.49	.50
		Soil conservation advise	.38	.49	.39	.49	.37	.48
	Life improvements		2.47	.97	2.55	1.02	2.46	.96
	Household expenditure		1399	1110	1237	888	1429	1144
Land tenure security – risk factor	Cultivate plot in 5 years		.67	.46	.75	.43	.68	.47
	Land ownership type		.81	.39	.85	.36	.81	.39
	Land ownership belief		.458	.50	.50	.50	.44	.5
	Plot-home distance		1.51	2.36	1.60	2.24	1.60	2.38
	Simpson Index		.78	.13	.77	.13	.78	.13
	Plot age		18.84	9.55	18.77	9.70	18.85	9.52
Market access	Town-residence distance		61.44	41.22	68.56	41.52	60.12	41.04
	Road-residence distance		33.42	33.27	36.06	33.00	32.93	33.30
	Market-residence distance		69.25	38.36	73	41.10	68.57	37.79
	Return from investment		.38	.49	.31	.46	.39	.49
Physical incentives	Highland		.32	.47	.31	.46	.32	.47
	Soil fertility		2.27	.72	2.29	.70	2.27	.73
	Plot slope		.06	.23	.09	.29	.05	.22
	Plot area		.22	.18	.22	.16	.22	.18
	Plot access to irrigation		.04	.21	.05	.21	.04	.20
	Major use of plot	Tree plant	.05	.21	.04	.20	.05	.22
		Grazing	.02	.14	.01	.07	.02	.15
Input	Past land investment intensity		25.14	52.41	4.75	19.97	28.93	55.61
	Modern fertilizer use		9.16	20.75	8.87	19.24	9.21	21.02
	Natural fertilizer use		156	395	183	390	151	395

Remark: Site dummies are included but not reported here.

4.2 Model Appropriateness: Box-Cox Tobit versus Box-Cox Double Hurdle Models

Model appropriateness was determined by examining the normality of the error terms. To give a feel for the distribution of the dependent variable over the 1005 adopters, a histogram is shown in Figure 1. The dependent variable shows a strong positive skewness, bringing us into doubt the validity of the normality assumption in the

error terms. Hence, we used the Box-Cox transformation (equation 11) and proceed with the Box-Cox estimation procedures.

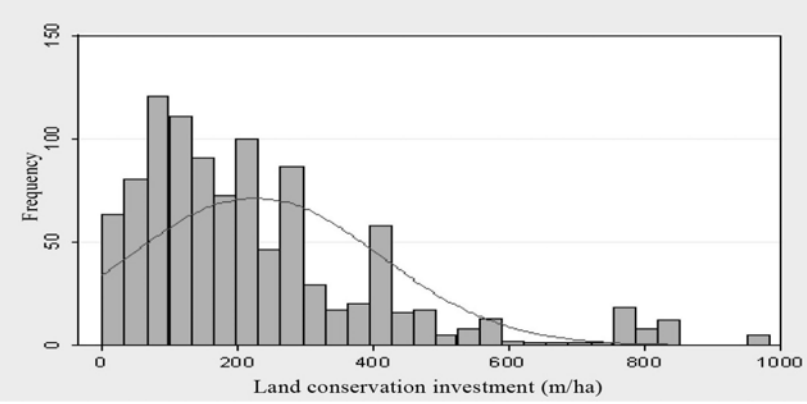

Figure 1. A histogram of land conservation investment

We estimated both Box-Cox tobit and Box-Cox double-hurdle models separately (see table 3 for estimation results (Note 12)), and then conducted a likelihood ratio test.

When testing the Box-Cox tobit model as a restricted version: likelihood ratio statistics, Γ , is 2(8823.38-8579.75)=487.26, which, when compared to the $\chi^2(48)$ [≈ 73.68, at the 1 percent-level of significance] distribution is seen to represent overwhelming evidence of the importance of the first hurdle. This confirms the superiority of the Box-Cox double-hurdle specification, implying that the plot-level decision to adopt land conservation and the decision about how much to invest appear to be governed by different processes. This is also confirmed by the result of the Akaike's information criterion (AIC), which is included at the foot of table 3. This is a model selection criterion which adjusts for the number of parameters and the model with the lowest AIC is preferred. The less formal "test" of comparing the Box-Cox tobit and Box-Cox double-hurdle models estimated coefficients also confirmed the above test results. This is implied from the existence of variables that significantly affect adoption decision without being significant factors for the intensity decision, and vice versa. Even among those that affect both adoption and intensity, the direction of effect for some is different. Furthermore, the estimated coefficients in the simpler Box-Cox tobit model are overestimated when compared to the corresponding estimates in the Box-Cox double hurdle model. This bias arises as a result of the invalid treatment of both hurdles as a single process in the former model.

Table 3. MLEs for Box-Cox tobit and Box-Cox double hurdle models (Dependent variable: Level of land conservation (m per ha.))

			Box-Cox tobit		Box-Cox double hurdle	
First hurdle			Coef.	Robust std. errors	Coef.	Robust std. errors
Constant					-136.96	123.24
Poverty-related factors	Income	Non-crop income			-0.05**	0.02
		Employment income			-0.04	0.03
		Cash crop income			-0.03	0.08
		Access to credit			11.45	22.86
	Non-liquid asset	Farm size			38.99**	18.86
		Number of cattle			0.18	6.52
		Number of ruminants			9.47	10.00
		Value of livestock			-0.01	0.02
		Value of live trees			0.01*	0.003
		Value of crop produced			0.01	0.01
	Human-capital	Male adults per hectare			4.40	7.91
		Female adults per hectare			15.48	12.40
		Dependent ratio			-33.72*	20.98
		Age of household head			0.022	1.13
		Male head of household			103.43	81.57
		Literacy of head			-23.74	30.24
		Marital status of head			-78.74	55.44
		Access to extension			82.63*	55.85
		Soil conservation advise			-51.87	35.67
	Life improvements: Social capital				24.80	23.21
	Household expenditure				-0.04**	0.02
Land tenure security – risk factor	Cultivate plot in 5 years				93.45*	60.80
	Land ownership type				-6.84	22.45
	Land ownership believe				15.49	39.50
	Plot-home distance				-3.67	3.54
	Simpson Index				149.75	162.38
	Plot age				-1.13	1.11
Market access	Town-residence distance				-0.32	0.36
	Road-residence distance				-0.98**	0.51
	Market-residence distance				0.25	0.34
	Return from investment				-55.36*	32.52
Physical incentives	Highland				-45.83	59.06
	Soil fertility				-18.96	15.93
	Plot slope				82.26**	35.11
	Plot area				-94.28*	39.98
	Plot access to irrigation				41.34	47.63
	Major use of plot for tree planting				-30.84	63.88
	Major use of plot for grazing				121.16	162.72
Input	Past land investment intensity				-3.08***	0.99
	Modern fertilizer use				0.32	0.29
	Natural fertilizer use				0.004	0.02
Village Dummy	Amanuel				-288.84**	134.47
	D.Elias				-371.24***	88.56
	Kebi				-216.22***	63.78
	Telma				-99.40	74.63
	Yamed				99.57	71.99
	Wolkie				-37.62	71.99
	Sekladebir				68.09	62.93

Table 4. continued (for the second hurdle).

Second hurdle			***Box-Cox tobit***		***Box-Cox double hurdle***	
			Coef.	*Robust std. errors*	*Coef.*	*Robust std. errors*
Constant			-253.97**	116.21	0.83	3.60
Poverty-related factors	Income	Non-crop income	-0.04*	0.02	0.0002	0.001
		Employment income	-0.06*	0.03	-0.0003	0.0004
		Cash crop income	-0.12**	0.05	-0.002*	0.001
		Access to credit	-54.36*	30.59	-0.88***	0.34
	Non-liquid asset	Farm size	18.55	22.64	-0.20	0.17
		Number of cattle	-2.23	6.15	-0.05	0.06
		Number of ruminants	-2.54	4.73	-0.18	0.23
		Value of livestock	0.01	0.01	0.0002	0.001
		Value of live trees	0.01**	0.00	0.0001	0.001
		Value of crop produced	0.01	0.01	0.000	0.000
	Human-capital	Male adults per hectare	6.34	6.72	0.04	0.11
		Female adults per hectare	-0.92	6.71	-0.21**	0.11
		Dependent ratio	-26.47	22.22	0.31	0.28
		Age of household head	-0.34	1.05	-0.002	0.03
		Male head of household	24.26	40.84	-1.46	1.69
		Literacy of head	-10.99	26.21	0.16	0.43
		Marital status of head	-35.22	39.79	0.94	1.15
		Access to extension	63.86**	31.52	-0.58	0.95
		Soil conservation advise	7.58	31.78	0.76*	0.52
	Life improvements: Social capital		31.09**	15.60	-0.15	0.54
	Household expenditure		-0.03**	0.01	0.001*	0.0004
Land tenure security – risk factor	Cultivate plot in 5 years		38.14	24.70	-1.19	1.16
	Land ownership type		44.50***	27.01	0.99**	0.53
	Land ownership believe		13.67	23.71	-0.14	0.58
	Plot-home distance		4.53*	2.85	0.21***	0.07
	Simpson Index		42.19	83.00	-2.22	2.46
	Plot age		-0.71	1.12	0.01	0.02
Market access	Town-residence distance		0.40	0.33	0.01	0.01
	Road-residence distance		0.32	0.35	0.03***	0.01
	Market-residence distance		-0.13	0.29	-0.01	0.01
	Return from investment		-109.32***	31.99	-0.68**	0.35
Physical incentives	Highland		-148.82***	51.87	-0.87	0.79
	Soil fertility		2.71	13.10	0.34	0.22
	Plot slope		87.36**	44.26	-0.35	0.72
	Plot area		71.39*	38.15	4.94***	1.82
	Plot access to irrigation		31.06	40.13	-0.31	0.62
	Major use of plot for tree plant		-96.96***	35.42	-0.65	0.59
	Major use of plot for grazing		-271.00***	92.83	-3.86***	0.77
Input	Past land investment intensity		-5.60***	1.41	-0.02***	0.01
	Modern fertilizer use		0.34	0.39	0.002	0.01
	Natural fertilizer use		0.04***	0.02	0.001***	0.001
Village Dummy	Amanuel		-274.02***	73.05	2.23	14.61
	D.Elias		-356.75***	85.63	4.46	3.73
	Kebi		-253.58***	75.12	-0.12	0.94
	Telma		100.75*	51.96	4.05***	1.53
	Yamed		164.41	56.60	1.35*	0.76
	Wolkie		-70.46	74.16	-1.17*	0.64
	Sekladebir		-12.52	58.15	-1.002	0.85
σ			269.49***	42.10	181.21***	38.39
λ			0.906***	0.029	0.88***	0.03

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Sample size (n)	6408	6408
Log L	-8823.38	-8579.75
Wald chi2 (48)	64.66	69.05
Prob > chi2	0.0545	0.025
AIC = (- LogL + k), where k is number of parameters	1.39, where k=51	1.35, where k=99

Standard errors are adjusted for clustering on household id in both the Box-Cox tobit and Box-Cox double hurdle estimations.

*P<0.10, **<0.05, ***<0.01.

4.3 Determinants of Adoption of Land Conservation Investment

The results of the Box-Cox double hurdle estimations for the first hurdle (i.e. adoption decisions) are presented in table 3. The table reports the estimated coefficients and their robust standard errors (adjusted for clustering on household identification). The chi-square test results are presented at the bottom of the table. The estimated likelihood ratio test shows that the model is a good fit overall. The results are discussed below with a focus on the role of poverty-related factors, land tenure security, and market access.

4.3.1 Poverty-related Factors

The negative relationship between poverty (in its different forms) and a household's decisions to invest on land conservation and the level of intensity is substantiated in various studies (Hagos and Holden, 2006; Gebremedhin and Swinton, 2003; Clay, et al., 2002; Holden and Shiferaw, 2002; Godoy, et al., 2001; Holden, et al., 1998).

We present our results for poverty-related factors by classifying them into income and asset variables. Cash-income (in the form of non-crop income), farm size, value of live trees, dependent ratio, access to extension services, and household consumption expenditure are statistically significant factors that explain farm households' investment decision in land conservation. The negative effect of non-crop income is in line with the argument that incomes from competing non-farm opportunities can discourage farmers' probability of investing in land conservation. This suggests that better returns from non-owned farms will compete for both labor and investment capital that could be used in agriculture.

Except for farm size and value of live trees, none of the non-liquid asset variables were found to affect the probability of plots receiving land conservation investment. Both of these are statistically significant factors that increase households' probability of investing in land conservation. The positive effect of farm size can be due to that land conservation requires size. While the result for the value of live trees could be interpreted as a reflection of the importance of wealth of the household, it can also be that the two are complements.

Except for the dependent ratio and household access to extension services, none of the human-capital variables were found to significantly affect decisions in land conservation investment. The result for the dependent ratio suggests that more dependents (such as children) in the family implies less time availability (for land conservation) for the non-dependents as the later have to spend more time taking care of their dependents than farming. The result for access to extension services suggests that households with access to extension services are more likely to invest in land conservation indicating the importance of such services perhaps through its effects on awareness and knowledge about such structures.

Household consumption expenditure is found to decrease the probability of a household's decision to invest in land conservation. This is similar to the results for measures of cash income reported above and it suggests that richer households are less likely to invest in land conservation.

The above result confirms that defining poverty in specific measurement units (such as cash-income, non-liquid asset, human and social capital assets) is important in land conservation studies. Given that assets often matter in natural resource management, defining poverty in accordance with income and/or expenditure alone may be restrictive. Sizeable resources over and above bare subsistence consumption and production amounts are required by the poor to address issues of resource degradation.

4.3.2 Land Tenure Security

Except for the variable for 'cultivate plot in 5 years', all the land tenure [in]security variables were found to be statistically insignificant. Households that feel certain that they will cultivate the plot for a longer period (five years after the survey) are associated with higher probability of investing on land conservation suggesting the importance of expectation about land tenure.

4.3.3 Market Access

Distance of a residence from nearest car road is found to be statistically significant in influencing adoption decision. Increase in walking minutes from the household's residence to the nearest car road decreases household's probability to adopt land conservation investment. This can be due to the expected less benefit from investing on plots with less transportation access. This is further amplified by the result for the variable: return on land conservation. A household's expectation of a return on land conservation investment positively affects (note how this variable is specified in table 1) the households' decision to adopt land conservation investment. A household which expected returns from land investment to increase productivity has a higher probability of investing in land conservation. This may be due to the importance of perceived positive marginal benefits received from undertaking land investment in terms of land quality improvements and increased yield.

4.3.4 Physical Incentives

Most of the indicators of physical incentives to invest in a plot, as reflected by plot-level variables, seem to have no role in a household's adoption decision. Plot slope and plot area are turned out to be the only physical incentive variables that affect the households' decision to adopt land conservation investment. Plots situated on steep ('*dagetama'*) slopes have a higher probability of receiving land conservation investment, which suggests that plots on steep slopes are associated with soil erosion and are often vulnerable to land degradation. There is a negative relationship between plot size and the probability of the plot receiving land conservation investment. An increase in size of a plot decreases the probability that the plot will receive land conservation investment. This may be explained by the fact that farmers are likely to invest first and foremost in their smaller parcel perhaps to increase productivity per hectare.

4.3.5 Alternative Land Inputs

With respect to use of alternative land conservation practices, past land-conservation investment intensity is found to be statistically significant. The higher the intensity of previous land conservation investment on a plot, the less likely that the plot will receive new land conservation investment. This shows the preference of farm households to invest primarily on plots that are not well conserved or plots with limited or no previous conservation structures.

4.3.6 Village -or Site- Level Effects

The last set of explanatory variables in our analysis includes village/site dummies. The results indicate that almost half of the village dummies were found to be statistically significant, suggesting the importance of site-level fixed effects. Though not directly implied from our study, village-level fixed variables or community and secteur level factors (including presence of community-led-investments such as Food for Work projects – learning by example) might have a stimulating role in the decision to invest in land conservation measures.

4.4 Determinants of Intensity of Land Conservation Investment

About 1,005 (or 16 percent) of the plot-level observations have positive land-conservation investment intensity. This section presents the results of the Box-Cox double hurdle estimations for the second hurdle (i.e. intensity of land conservation investment) as presented in the second half of table 3. The Wald chi-square test results (presented at the bottom right of table 3) indicate that all the variables in the model are jointly and significantly different from zero, at least at the 5 percent level. The first point to be noted from the results is that many of the determinants of level of land conservation have effects contrary to those of the determinants of adoption.

4.4.1 Poverty-related Factors

Similar to the results for adoption probability, cash-income (in the form of cash-crop income and credit access) appears to be important in the second hurdle. Cash crop income has a negative and statistically significant relationship with the intensity of conservation, a result not in line with expectations. Access to credit, although insignificant in influencing adoption decision, turned out to be strongly significant in explaining investment intensity. While access to credit could mean better capacity to invest in land conservation, better access to credit is found to be associated with lower levels of land conservation investment.

Unlike the first hurdle decision, none of the non-liquid variables are significant in the second hurdle. Among the human capital variables, however, number of female adults in the household and access to soil conservation advice play important role in the second hurdle. An additional female adult in the household is associated with lower levels of land conservation. We do not have a good explanation as to why female adult labor is significant and not male adult labor. However, the result seems to amplify the gender-specific nature of labor division in Ethiopia, suggesting that female labor availability represents a different asset type and is less important in intensifying land conservation investment. Compared to households that have never received advice about soil conservation, land-conservation

intensity increased for those who were advised. It is also interesting to note that, while access to extension services (which often focuses on general issues related to agriculture) affects adoption, access to advice on soil conservation affects intensity. This suggests that once the household passes the first hurdle of the adoption decision, advice on specific soil conservation issues is more important in order for the household to intensify land conservation investment. Unlike its effect on the first hurdle, household consumption expenditure appears important in the second hurdle, with household expenditures being associated with higher land conservation intensity. This is in line with our expectation that richer households are more likely to intensify land conservation.

4.4.2 Land Tenure [In] Security

Plots that are owner-cultivated are associated with higher intensity of receiving land conservation than plots either mortgaged (in/out) or rented (in/out). Due to the usually short duration of tenure holding and other incentive problems associated with plots that are rented or mortgaged, such a plot receives less land conservation investment than a plot that is owner-cultivated. This result is in line with neo-classical economic theory which suggests, all things being equal, that reduced risk and longer planning horizons should enhance expected returns and encourage investment. It also supports earlier works, such as Alemu, 1999; Feder, et al., 1988; Gebremedhin and Swinton, 2003; Rahmato, 1992.

We also find that greater distance of plots from the homestead is associated with higher intensity. At first glance, this result seemed contrary to our prior expectations that plots not remote from the homestead would receive more land conservation investment, due to not only to the lesser transaction cost involved but also the stronger degree of security attached to homestead farms (or farms closer to the homestead), where land redistribution is infrequent. The result, however, makes more sense when one examines the rural land policy of Ethiopia. According to the Rural Land Administration and Land Use Proclamation of Ethiopia, "a holder of rural land shall have the obligation, among others, to use and protect his land. And when the land gets damaged, the land user should lose his right." Plots at far distances from the homestead are where frequent land redistribution often occurs. Thus, a possible explanation is that households are perhaps conserving first a plot at remote distance from their residences in an attempt to have greater security over the plot.

4.4.3 Market Access

Unlike the adoption decision model, distance of a residence from the nearest car road turned out to be statistically and positively significant in influencing intensity: increase in walking minutes from the household's residence to the nearest car road increases land conservation intensity. This is perhaps because the limited (or absent) alternative off-farm employment opportunities (during the dry season, in particular) and the prevalence of lower wages in distant places reduce the opportunity cost of family labor and the cost of hiring labor, and thus lower the opportunity cost of labor-intensive investments in land conservation. Expectation of return on investment is significant in both adoption and intensity models. Similar to its effect in the first hurdle, return on investment has positive effect in the second hurdle. In particular, intensity decreases among the households that expect returns from land investment to decrease or at least not change productivity. This suggests the importance of perceived positive marginal benefits received from undertaking investment in terms of land quality improvements and increased yield.

4.4.4 Physical Incentives

Among the physical incentives, plot area and grazing plots were found to be significant in influencing investment intensity in land conservation. Given that intensity in our model is measured as meters per hectare, the positive relationship between plot area and intensity is in contrary to prior research results. As argued by Gebremedhin and Swinton, 2003, for instance, larger fields have fewer meters of conservation per hectare because of their indivisibility and diminishing marginal returns on conservation structures within a plot. Regarding major use of the plot, the result suggests that plots mainly used for grazing are associated with a higher intensity than plots that are mainly used for farming and/or fallowing.

4.4.5 Alternative Land Conservation Practices and Site Dummies

Similar to its effect on probability of adoption, past land investment intensity has a significantly negative effect on land conservation intensity. The more a plot received land conservation investment in the past, the less it will receive new land conservation investment in the current year. This shows the preference of farm households to invest primarily on plots that are not well conserved or plots with limited or no previous conservation structures. Natural fertilizer use is found to complement intensity of land conservation investment. Some of the site dummies were significant, suggesting that there are differences in intensity of land conservation across sites.

5. Summary and Conclusions

Using panel data from Ethiopia and the Box-Cox double-hurdle model, this study explores the factors affecting farm households' decision to invest in land conservation and their decision on how much to invest at the plot level, focusing on the roles of poverty, land tenure [in]security, and market access.

The results demonstrate that the decision to adopt land conservation investment and the decision about how much to invest appear to be explained by different processes. The relevant policy and program tools for encouraging land conservation investment depend on whether or not farm households are already convinced of the need to adopt land conservation investments.

In general, poverty-related factors seem to have a mixed effect on adoption as well as intensity decisions. While a farmer's adoption decision is influenced by whether or not the farmer is certain to cultivate the plot for a longer period (in 5 years time), the intensity of land conservation is determined by farmer's belief of land ownership, and plot-home distance. Our results amplified the gender-specific nature of labor division in Ethiopia, suggesting that female labor availability represents a different asset type in intensifying land conservation investment. While access to extension services (which is often focuses on general issues related to agriculture) affects adoption, access to advice on soil conservation affects intensity. Furthermore, our results show a preference of farm households to invest first and foremost on plots that are not well-conserved or plots with limited or no previous conservation structures.

All in all, our study confirms the complexity of land-conservation investment decisions. This is highlighted by the large number of statistically significant variables in the models, each marginally contributing to the overall decision to invest or not, as well as to the decision on how much to invest. A lesson for policymakers is that major changes in land conservation investments will require attention to all these factors because no single factor can be used as a major policy leverage instrument. Some of these factors (such as land tenure security, plot size, and total farm holdings) can be directly influenced by government policies and programs.

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Notes

Note 1. Gebremedhin and Swinton, 2003, for instance showed that land conservation structures were less than the average requirement of 700 meters per hectare of stone terraces or soil bunds to conserve one hectare of land and effectively reduce soil erosion in the typical sloped areas of northern Ethiopia.

Note 2. To our knowledge, the only exception is Gebremedhin and Swinton, 2003.

Note 3. A 'Kebele' is the smallest administrative unit of local government in Ethiopia, similar to a ward or a neighborhood association.

Note 4. This study focused on total household-plot level conservation investment instead of disaggregating them into different types. In such an approach in addition to stone terraces and soil bunds we also include the efforts of farmers that invest on other land conservation measures such as ditch-digging, 'Kitir' works, and other types including grass-cover, counter-farming and forestation.

Note 5. Because of its role in reducing soil erosion effectively, we consider density of land conservation (m/ha) as a more appropriate measure than total length per household-plot.

Note 6. Moreover, as underscored in Feder, et al., 1992, it is necessary to go beyond the typical binary dependent variable methods applied to cross-sectional surveys on technology adoption.

Note 7. It may be that they do not believe that taking care of the land is their responsibility, which is possible in Ethiopia where land is not privately owned, or it may be that they do not adopt because of their belief that their adoption will unlikely make any real difference.

Note 8. The independent assumption is a common practice in these kinds of models (see Jensen and Yen, 1996; Newman et al., 2003).

Note 9. For simplicity, some variables were classified into a category that better described them. For instance, access to credit could have been included in the market access category rather than with poverty-related factors.

Note 10. Because of the gender specific nature of the division of labor in most rural areas of Ethiopia, we made a distinction in the availability of labor between the two genders.

Note 11. Farm fragmentation can be expressed by three measures: the number of plots; the average distance to the parcels in each farm; and the Simpson index, which can be calculated as 1 minus the ratio of the sum of squared parcel areas to the squared area of the total farm (it takes the value between 0 and 1) (see Bellon and Taylor, 1993).

Note 12. Gujarati, 1995, states that multicollinearity may become a problem if the Pearson correlation coefficient exceeds 90%. Our results from a correlation matrix for the independent variables suggest that none of the correlation coefficients exceeded 48%.

The Relationship between Accruals Quality, Earnings Persistence and Accruals Anomaly in the Canadian Context

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Abstract

The aim of this paper is twofold. First, we examine whether accruals' low reliability explains bias in earnings persistence coefficient. Second, we test whether investors overestimate persistence of low reliability components of accruals. To test our hypotheses, we use a sample of Canadian firms listed on the Toronto Stock Exchange for the period 2002- 2005. The results show that: (1) low reliability of some accruals components seems to partially explain bias in earnings persistence coefficient; (2) not only do Canadian investors overestimate low reliability components of accruals, but also some high reliability components.

Keywords: accruals, reliability, market efficiency, earnings persistence, abnormal returns

1. Introduction

The information content of earnings in relation to future earnings depends on earnings components. Indeed, when accounting earnings consist primarily of transitory elements, its information content regarding future earnings and stock prices is low. However, when earnings consist mainly of permanent elements, its information content is more important. Accordingly, earnings' predictive power follows from its persistent component (Charitou, Clubb, & Andreou, 2001; Martinez, 2004). The persistent component is the part of unexpected earnings which continuously recurs. It consists essentially of recurring elements and transitory elements that have long term effects (Martinez, 2004).

Studies of earnings forecasts highlighted the importance of analyzing the accruals and cash flows components of current earnings (Cotter, 1996; Bernstein, 1993). The accruals component is more affected by transitory events than the cash flows component (Charitou et al., 2001). In contrast to cash flows that are real and less subject to distortion, determining accruals value is impregnated with high subjectivity (Bernstein, 1993). In fact, accruals component correspond to expected future cash flows, deferrals of past cash flows, allocations and assessments, all of which involve a high degree of subjectivity (Richardson, Sloan, Soliman, & Tuna, 2005). Determining accruals reflects accounting policy and flexibility degree that managers deploy while exercising professional judgment. Managers may use judgment in financial reporting to alter financial reports in order to achieve specific goals (Healy & Wahlen, 1999). Accruals measurement error resulting from intentional earnings management (managerial opportunism) and unintentional earnings management (neutral application of accounting rules) affects accruals reliability. Therefore, the two components of current earnings, accruals and cash flows, have different characteristics and consequently different implications in future earnings prediction. Sloan (1996) shows that because of the great subjectivity in determining accruals, current earnings are less likely to persist when they consist primarily of accruals and more likely to persist if they consist mainly of cash flows. Thus, the difference between accruals quality and cash flows quality affects earnings persistence. Penman and Zhang (2002) consider earnings persistence as a good quality indicator. The authors add that high-quality earnings are predictable and sustainable earnings. Sloan (1996) also shows that investors fixate on earnings and fail to fully reflect the difference between properties of accruals and cash flows in forecasting future earnings. By equally weighting both earnings' components, investors tend to incorrectly overvalue persistence of the accruals component of current earnings when forming future earnings expectations, which leads stock prices to deviate from their intrinsic values and adjust their forecasts when realized earnings are less than expected for high-accrual firms (Mashruwala, Rajgopal, & Shevlin, 2006; Zhang, 2007). The negative relationship between current accruals and future stock returns is known as *accruals anomaly*.

Most studies dealing with accruals anomaly adopt Healy's definition of accruals which only takes into focus current accruals (Sloan, 1996; Xie, 2001; Chan, Chan, Jegadeesh, & Lakonishok, 2006; Zhang, 2007). In addition, most studies on accruals quality examine the U.S. financial market. However, accruals quality depends on the countries'

generally accepted accounting principles (GAAP). Rules-based GAAP intentionally minimize managers accounting judgment by establishing articulated rules that anticipate all possible application challenges and attach great importance to the reliability of accounting numbers than principles-based GAAP (Webster & Thornton, 2005).

This study examines on the one hand the relationship between accruals quality and earnings persistence and on the other hand attests for whether available information on accruals quality is reflected in stock prices. Unlike previous studies, we adopt a more comprehensive definition of accruals proposed by Richardson et al. (2005). Indeed, Healy's definition neglects several components of accruals, some of which are considered low reliability components. Neglecting these components leads to a noisy measurement of accruals and cash flows. Additionally, we chose to examine the Canadian context because, unlike the U.S. GAAP which is rules-based, Canadian GAAP is principles-based.

The defendants of rules-based GAAP consider that the greater the latitude given to managers in their professional judgment, the less is accruals quality. Phillips, Pincus, and Rego (2003) reveal that earnings management is accomplished using managerial discretion and typically there is more discretion under principles-based GAAP than under tax rules. The discretion given to managers in their professional judgment is subject to opportunistic use and being such affects accruals reliability. However, Skinner (1995) considers that sound professional judgment in the context of principles-based GAAP improves financial reporting quality in general and accruals quality in particular. Nevertheless, the results obtained by Berthelot (2000) support the possibility that the Canadian firms' managers benefit from flexibility afforded by the guidelines of the Canadian Institute of Chartered Accountants (CICA) to influence reported earnings. Janin and Piot (2008) report that investors fail to distinguish between opportunistic and misleading accounting manipulations and accounting manipulations that allow managers the possibility to enhance information content of accounting numbers. Webster and Thornton (2005) reveal that accruals overall quality does not only depend on standards, but also on other elements of the whole information system. They conclude that there is no difference between accruals quality of Canadian firms and that of U.S. firms. Our paper adds to the debate on the impact of professional judgments on accruals quality by studying the relationship between accruals reliability and bias in earnings persistence coefficient in the Canadian context. This is to test whether this bias is mainly due to accruals component and whether it depends on the estimation error of some items included in the calculation of accruals reported by firms.

The purpose of this paper is twofold. First, we propose to test the relationship between low reliability of some items included in the calculation of accruals and bias in earnings persistence coefficient. Second, we examine whether Canadian investors correctly interpret available information on accruals quality while predicting future earnings.

The remainder of the paper is organized as follows. The second section develops our hypotheses. The third section describes our methodology. The fourth section presents the sample and data sources. The fifth section discusses the empirical results and the sixth section concludes.

2. Research Hypotheses

Cash flows reflect objective elements and can be easily validated by the auditor (Piot, 2008). Conversely, some components of accruals need professional judgment while being determined (stocks, receivables, depreciation, contingent liabilities, etc.), which may induce measurement errors (Note 1). Therefore, validating accruals value needs specific diligence from the part of auditors. However, firms are subject to a strong demand for information, and therefore ask auditors to prepare annual reports at short notice, which affects reliability of accounting numbers (Piot, 2008). Additionally, as part of the principles-based GAAP, external auditor' signature quality should primarily reflect the relevance of accounting numbers rather than their reliability (Janin & Piot, 2008).

The Financial Accounting Standard Board (Statements of Financial Accounting Concepts SFAC 2) defines reliability as the main quality of financial reporting, which means that users have to ensure that the presentation of operations and the underlying facts is consistent with reality and reasonably error and bias-free. Thus, errors arising from professional judgments while determining accruals affect their reliability. It implies that the earnings' accruals component is more affected by transitory events than a cash flow component to the extent that the response coefficient of the accrual component is greatly reduced than the response coefficient of the cash flow component (Charitou et al., 2001). Richardson et al. (2005) show that an increase in accruals measurement error leads to an increase in their persistence coefficient bias compared to cash flow persistence coefficient.

Canadian principles-based GAAP give managers great latitude to make their professional judgments. This flexibility may affect accruals reliability and therefore their persistence in the subsequent period. Thus, our first hypothesis proposes that bias (downward) in accruals persistence coefficient is greater than bias in cash flows persistence coefficient.

H_1: The persistence coefficient on current earnings' accruals component is lower than the persistence coefficient on their cash flows component.

In the absence of accruals accounting, the only account that is recognized in the balance sheet is the cash asset account. All other accounts are the product of accruals accounting process. According to Richardson et al's definition (2005), accruals reflect the change in net non-cash assets. The authors divide accruals into current operating accruals, non-current operating accruals and financial accruals. Thus, Healy's definition (1985) neglects the last two components of accruals. Since not all accrual accounts are subject to management manipulation and consequently do not have the same degree of reliability (Richardson, Sloan, Soliman, & Tuna, 2001), we will analyze reliability of various components of accruals and hypothesize bias in their persistence coefficients.

Current operating accruals are the change in current operating assets nets of cash and short term investments minus the changes in current operating liabilities. The specific current operating assets to focus on are accounts receivable and inventory. Dechow, Sloan, and Sweeney (1995) consider that accounts receivable are the most widely used in revenue manipulation or margin manipulation through premature recognition of revenue (assuming all costs are fixed or all costs are variables). For the inventory component, managers may delay writing an obsolete inventory or allocate more charges (Chan et al., 2006). Thus, changes in accounts inventory and receivable are considered with low reliability and may be the cause of misestimating accruals persistence (Thomas & Zhang, 2002; Chan et al., 2006).

The main account driving liabilities are accounts payable. They reflect financial obligations that are recorded at their nominal values and can usually be measured with high reliability (Richardson et al., 2005). Thus, change in current operating liabilities is considered highly-reliable. Current operating accruals are the sum of low reliability and high reliability accruals. They are therefore of medium reliability and their persistence coefficient bias is relatively more important than cash flows persistence coefficient bias. Hence our second hypothesis assumes that:

H_2: persistence coefficient on current operating accruals is lower than persistence coefficient on cash flows.

The second component of accruals is the non-current operating accruals. It is the change in non-current assets (excluding long term investments and advances) minus change in non-current liabilities (nets of long term debt). The main accounts driving non-current operating assets are tangibles and intangibles. Considerable uncertainty exists in the evaluation of these accruals for several reasons. First, there is great subjectivity in assessing property produced by the firm. As these assets are internally generated, it is sometimes difficult to determine whether they meet the criteria for recognition, either because of uncertainty about the future economic benefits to be generated, or because of problems of evaluating the assets cost. CICA Handbook Section 3062 provides guidance on accounting for intangible assets. However, these details do not deal with internally-generated assets. Second, the improper capitalization of operating expenses can lead to artificial inflation of the firm's assets value. Paragraphs 1000. 26 and 1000. 51 of the CICA Handbook are interpreted by some entities as allowing for delaying a variety of charges. A portion of deferred charges do not meet the definition of assets or the criteria for recognition (Conseil des normes comptables, 2007). In the same vein, Berthelot and Labelle (2007) report that the Canadian standards' distinction between research and development opens the door to manipulation possibilities. As research costs are directly charged to earnings and development costs are capitalized in the balance sheet, managers may try to use their discretion to manipulate earnings. Landry and Callimaci (2003) show that large Canadian firms as well as those whose ownership structure is concentrated, are less likely to capitalize development costs. Third, there is great subjectivity in determining depreciation amount. Write-downs help to restrict firms on reporting in their balance sheets asset values that exceed their probable future economic benefits. However, the discretion given to managers in determining timing and amount of write-downs has been controversial. Via a case study of a Canadian company, Inco Ltd., Hilton and O'Brien (2009) show that managers' discretion may affect valuation of assets. While some firms take big baths to reduce future reported costs and increase their future earnings, other firms report overvalued assets to give the impression that they have a strong financial position. Thus, the change in non-current operating assets is considered of low reliability.

The non-current operating liabilities are driven by a variety of accounts. Some of these accounts (such as contingent liabilities, postretirement benefits) are subject to a highly- subjective assessment and where management has a high degree of accounting flexibility. Contingent liability, such as warranty liability, is different from other monetary liabilities, such as bank loans. In fact, managers might be discrete over the accounting treatment of warranties as a means of opportunistic earnings management. These opportunistic accounting decisions can be achieved through changes in the assumptions and estimates underlying warranty accruals. Cohen, Darrough, Huang, and Zach (2011) show that managers use warranty accruals to achieve specific financial reporting objectives. In particular, they report that abnormal warranty expenses are associated with two popularly cited earnings targets: avoiding reporting

a loss and avoiding reporting an earnings decrease. Moore (2008) finds evidence supporting management's opportunistic use of pension accounting assumptions to reduce reported pension expense. In the same vein, Costello, Machuga, and Teitel (2010) provide empirical evidence on how managers use long term accruals such as postretirement benefits to manage earnings in subsequent years and increase the likelihood of meeting earnings targets. That is, managers do in fact make discretionary choices in year t that increase the likelihood of the firm meeting earnings targets in year t+1. They report that assumptions used to account for postretirement benefit costs can also be used as an earnings management tool because: (1) accounting rules give managers great flexibility in setting the assumptions; (2) complexity of accounting rules and related disclosures make it difficult for outside users to identify changes in assumptions and their economic effects; and (3) liability is long term in nature enabling small changes in assumptions to have a large impact on the financial statements. Thus, change in non-current operating liabilities is described as of medium reliability. Non-current operating accruals are the sum of low and medium reliability accruals. Hence our third hypothesis runs as follows:

H_3: persistence coefficient on non-current operating accruals is lower than persistence coefficient on cash flows.

The third component of accruals is financial accruals. It is the change in financial assets (such as long term investments and short term investments) minus change in financial liabilities (such as long term debt and short term debt). Short term investments, short term debt and long term debt are measured with high reliability. However, long term investments, such as long term receivables, can be used while manipulating earnings and error margin in their determination is greater (Richardson et al., 2005). Overall, financial accruals are determined with high reliability and therefore their persistence coefficient bias is not more important than in cash flows persistence coefficient. Our fourth hypothesis assumes that:

H_4: the difference between persistence coefficient on financial accruals and persistence coefficient on cash flows is not significant.

In addition to testing the above-mentioned assumptions, we propose to examine presence of accruals anomaly in the Canadian context. In particular, we examine whether stock prices reflect earnings components' different properties.

The relationship between stock prices and earnings has been widely debated. Since the pioneering work of Ball and Brown (1968), several studies have documented a positive relationship between stock returns and earnings (Pfeiffer, Elgers, Lo, & Rees, 1998; Charitou et al., 2000, 2001; Easton & Harris, 1991; Collins & Kothari, 1989). This relationship is explained by the ability of earnings to reflect relevant information about firm performance. However, some studies report that investors fixate on earnings and fail to fully reflect information about accruals quality in predicting future earnings (Sloan, 1996; Thomas & Zhang, 2002; Cheng & Thomas, 2006). By equally weighting accruals and cash flows components, investors overestimate persistence of current earnings' accruals in predicting future earnings. This leads to a deviation of stock prices from their intrinsic values. Investors adjust their forecasts in the subsequent period, after accruals reversals. Consequently, accruals will be negatively related to future stock returns, a relationship well- known as the *accruals anomaly*. The overvaluation of firms' securities with high accruals will be corrected once the reported earnings turn out to be weaker than the expected earnings. Thus, our fifth hypothesis assumes that:

H_5: Canadian investors overestimate persistence of low reliability accruals components in predicting future earnings and adjust their anticipation in the subsequent period.

If investors do not anticipate low persistence of low reliability accruals components and adjust their forecasts in the subsequent period, the relationship between these components and the subsequent abnormal returns will be negative.

3. Methodology

3.1 The Relationship between Accruals Reliability and Bias in Earnings Persistence Measurement: The Earnings Persistence Models

Freeman, Ohlson, and Penman (1982) show that the book rates-of-return follow a mean-reverting process and changes in rates-of-return strongly correlate with changes in earnings. Hence, the current book rate-of-return provides a basis for predicting future earnings. Thus, we get:

$$ROA^{*}_{it+1} = \varphi + \gamma\, \mathrm{ROA}^{*}_{it} + \varepsilon_{it+1} \quad (1)$$

Where ROA_{it}^{*} is the actual return on asset i in year t defined as the actual earnings deflated by average total assets.

By replacing ROA_{it}^{*} with their cash flows and accruals components, equation (1) can be written as:

$$ROA^{*}_{it+1} = \varphi + \gamma\, CF_{it} + \gamma\, AC^{*}_{it} + \varepsilon_{it+1} \quad (2)$$

Where AC_{it}^{*} is the actual accruals of firm i in year t and CF_{it} is the cash flows of firm i in year t. All variables are scaled by average total assets.

As accruals are measured with errors, earnings reported by the firms, ROA, are biased measures of their actual earnings, ROA^{*}. Hence, we get:

$$AC_{it} = AC_{it}^{*} + e_{it} \tag{3}$$

$$ROA_{it+1} = \mathrm{ROA}_{it+1}^{*} + e_{it+1} \tag{4}$$

Where ROA_{it+1} is the reported return on asset i in year t+1 defined as net income before extraordinary items scaled by average total assets and AC_{it} is the reported accruals of firm i in year t scaled by average total assets.

Substituting the above relationships into (2), we get:

$$ROA_{it+1} = \varphi + \gamma\, CF_{it} + \gamma\, AC_{it} + \upsilon_{it+1} \tag{5}$$

Where $\upsilon_{it+1} = \varepsilon_{it+1} + e_{it+1} - \gamma\, e_{it}$

Because υ is correlated with AC via error term e, the estimated coefficients on CF (γ_{CF}) and AC (γ_{AC}) are biased estimates of γ. Richardson et al. (2005) report that bias is measured as follows:

$$(\gamma_{AC} - \gamma) = \frac{-\gamma \dfrac{\mathrm{var(e)}}{\mathrm{var}(AC)}}{1 - \varphi_{CF,AC}^{2}} \tag{6a}$$

$$(\gamma_{CF} - \gamma) = -\varphi_{CF,AC}\,(\gamma_{AC} - \gamma) \tag{6b}$$

Where var (e), var (AC) is the variance of e and AC, respectively and $\varphi_{CF,\,AC}$ is the correlation coefficient between CF and AC.

More measurement error in accruals (e) is important, the greater the bias (downward) in the persistence coefficient on accruals compared to that on cash flows. Therefore, the estimated coefficient on AC is lower than that on CF. The equation actually estimated is as follows:

$$ROA_{it+1} = \varphi_0 + \varphi_1\, CF_{it} + \varphi_2\, AC_{it} + \upsilon_{it+1} \tag{7}$$

Similar to Richardson et al. (2005) and to emphasize the fact that persistence coefficient on accruals is lower than that on cash flows; we replace CF by the difference (ROA - AC) in equation (7). Hence, we get:

$$ROA_{it+1} = \gamma_0 + \gamma_1\, ROA_{it} + \gamma_2\, AC_{it} + \upsilon_{it+1} \tag{8}$$

Where, $\gamma_{1} = \varphi_1$ and $\gamma_2 = (\varphi_2 - \varphi_1)$.

Therefore γ_2 measures the difference between persistence coefficient on accruals and persistence coefficient on cash flows. Hypothesis H_1 states that persistence coefficient on accruals is lower than persistence coefficient on cash flows. Thus, we have $(\varphi_2-\varphi_1) <0$. Regressing the modified version of equation (7) provides direct estimation of $(\varphi_2-\varphi_1)$. If hypothesis H_1 is valid, we will have $\gamma_2 <0$.

Because some components of accruals are measured with high reliability, while others are considered of low reliability, magnitude of bias in measuring their persistence differs from one component to another. This shows the importance of decomposing accruals. Thus, to test hypotheses H_2, H_3 and H_4, we decompose accruals into three components as follows:

$$ROA_{it+1} = \varphi_0 + \varphi_1\, CF_{it} + \varphi_2 \Delta WC_{it} + \varphi_3 \Delta NCO_{it} + \varphi_4 \Delta FIN_{it} + \upsilon_{it+1} \tag{9}$$

Where ΔWC is current operating accruals, ΔNCO is non-current operating accruals and ΔFIN is financial accruals. All variables are scaled by average total assets. By analogy to equation (8), we can write:

$$ROA_{it+1} = \gamma_0 + \gamma_1\, ROA_{it} + \gamma_2 \Delta WC_{it} + \gamma_3 \Delta NCO_{it} + \gamma_4 \Delta FIN_{it} + \upsilon_{it+1} \tag{10}$$

With, $\gamma_2=\varphi_2-\varphi_1$; $\gamma_3=\varphi_3-\varphi_1$; $\gamma_4=\varphi_4-\varphi_1$.

Thus, γ_1 measures persistence coefficient on cash flows component. γ_2, γ_3 and γ_4 measure the difference between persistence coefficient on each component of accruals and that on cash flows component. Hypotheses H_2 (ΔWC), H_3 (ΔNCO) and H_4 (ΔFIN) imply that $\gamma_2<0$, $\gamma_3<0$ and $\gamma_4=0$, respectively.

The exogenous variables are defined in Table 1.

Table 1. The definition of exogenous variables

Variables (tested hypothesis)	Definition
AC (H_1 : $\gamma_2<0$ in eq. (8))	the total accruals : ΔWC + ΔNCO + ΔFIN
ΔWC (H_2 : $\gamma_2<0$ in eq. (10))	the current operating accruals : [ΔCurrent Assets– ΔCash and Short Term Investment] – [ΔCurrent Liabilities– ΔDebt in Current Liabilities]
ΔNCO (H_3 : $\gamma_3<0$ in eq. (10))	the non-current operating accruals : [ΔTotal Assets – ΔCurrent Assets– ΔLong Term Investments and Advances] – [ΔTotal Liabilities – ΔCurrent Liabilities – ΔLong Term Debt]
ΔFIN (H_4: $\gamma_4=0$ in eq. (10))	the financial accruals : [ΔLong Term Investments and Advances + ΔShort Term Investments] – [ΔLong Term Debt + ΔDebt in Current Liabilities]

All the variables mentioned above are scaled by average total assets.

3.2 Pricing Models

The efficient-market hypothesis postulates that the current stock price reflects all available information that may influence the stock's future value (Fama, 1970). In an efficient market, an investor can not consistently achieve returns in excess of average market returns given the already available information. Thus, there is no relationship between current accruals and subsequent abnormal stock returns. However, if investors fail to anticipate the lower persistence of the low reliability accruals, they will adjust their expectations in the subsequent period, following the reversal of these accruals (Richardson et al., 2005). Thus, the relationship between low reliability accruals components and subsequent abnormal returns will be negative.

To test our fifth hypothesis dealing with the ability of Canadian investors to rationally anticipate implications of current accruals (and its components) for future earnings and according to Richardson et al. (2005), we regress the following equations:

$$RET_{it+1} = \gamma_0 + \gamma_1 ROA_{it} + \gamma_2 AC_{it} + \vartheta_{it+1} \tag{11}$$

$$RET_{it+1} = \gamma_0 + \gamma_1 ROA_{it} + \gamma_2 \Delta WC_{it} + \gamma_3 \Delta NCO_{it} + \gamma_4 \Delta FIN_{it} + \vartheta_{it+1} \tag{12}$$

Where RET_{it+1} denotes buy-and-hold abnormal returns of firm i in year t +1. They are calculated using the Market Adjusted Return model as follows:

$$RET_{it} = \prod_{\tau=4}^{15}(1 + R_{i\tau}) - \prod_{\tau=4}^{15}(1 + R_{indice\,\tau}) \tag{13}$$

With $R_{i\tau}$ is the monthly return of firm i for month τ, $R_{indice\,\tau}$ is the monthly return of the stock index S & P/TSX for the month τ and $\tau = 4$ corresponds to four months following the end of the fiscal year. This delay ensures that investors can access to information about financial statements. Other variables of equations (11) and (12) are defined in Table 1. Hypothesis H_5 states that investors overestimate persistence of low reliability accruals in their anticipation of future earnings and adjust their expectations in the subsequent period. Thus, H_5 implies that $\gamma_2<0$ (AC) in equation (11). Similarly, H_5 assumes that $\gamma_2<0$ (ΔWC), $\gamma_3<0$ (ΔNCO) and $\gamma_4=0$ (ΔFIN) in equation (12).

4. Sample and Data Sources

The initial sample included Canadian firms listed on the Toronto Stock Exchange over the period 2001-2006. It consists of 1, 594 firm-year observations. Since regressions rely on change in variables, as well as future variables,

the final sample is from 2002 to 2005. We chose to begin our analysis starting from 2002 and not before because of the 2002 stock market crash. Our empirical analysis uses annual stock returns calculated starting four months after the end of the fiscal year and ending twelve months later. Thus, the subsequent abnormal returns (RET_{it+1}) relating to fiscal year 2002 exclude returns affected by the 2002 stock market crash. In addition, we chose to exclude observations related to the year 2006 and following, because of the 2008 financial crisis. Indeed, to compute RET_{it+1} for the year 2006 we use stock returns of 2008 affected by the financial crisis.

We exclude from the sample financial firms because the distinction between operating activities and financing activities is not clear in this category of firms. We also eliminate firm-year observations with insufficient data to compute the principal variables used in our tests. The final sample consists of 803 firm-year observations with available stock prices and financial statement data in prior, current, and subsequent years. Accounting data are collected manually from the firms' financial statements available on the SEDAR database, while market data are collected from the Canadian database of the Canadian Financial Markets Research Centre.

5. Empirical Results

5.1 Descriptive Statistics

Table 2 provides descriptive statistics (panel A) and the variables' correlation matrix (panel B). Panel A shows that the mean value of TACC is positive (0. 062). Accruals' positive mean value differs from accruals' negative mean value documented by Sloan (1996). Richardson et al. (2005) explain this difference by the fact that Sloan's definition of accruals includes reversal of some non-current operating asset accruals, yet it does not include the origin of these accruals. Panel A also shows that mean values of ΔNCO (0.065) and ΔWC (0.006) are positive, while mean value of ΔFIN (-0.010) is negative. These results show that Canadian firms finance their growth by increasing their net operating assets and reducing their net financial assets. Examination of accruals components also reveals that standard deviations of ΔNCO (0.209) and ΔFIN (0.169) are higher than standard deviation of ΔWC (0.088). Thus, ΔNCO and ΔFIN are the most important sources of variation in the total accruals. This result suggests that previous studies which used Healy's definition of accruals ignored the most important sources of variation in total accruals.

Panel B of table 2 indicates that there is a strong correlation between the various components of accruals. Both ΔWC and ΔNCO are strongly negatively correlated with ΔFIN. This result shows that Canadian firms tend to finance growth of net operating assets by using their financial assets and/or loans (liabilities). In addition, the positive correlation between ΔWC and ΔNCO shows that Canadian firms tend to grow their current and non-current operating assets in tandem. All correlation coefficients of exogenous variables reported in Table 2 are less than the 0.8 limit fixed by Kennedy (1985) from which multicollinearity becomes a serious problem that affects relevance of the results.

Table 2. Descriptive statistics and correlation matrix

Panel A: Descriptive statistics							
	Mean	Median	Maximum	Minimum	Std. Dev		
AC_t	0.062	0.044	0.891	-0.917	0.218		
ΔWC_t	0.006	0.003	0.524	-0.566	0.088		
ΔNCO_t	0.065	0.018	0.962	-0.671	0.209		
ΔFIN_t	-0.010	0.000	0.976	-0.786	0.169		
ROA_t	0.018	0.062	0.569	-0.962	0.180		
ROA_{t+1}	0.027	0.066	0.868	-0.897	0.181		
RET_{t+1}	-0.011	-0.010	0.162	-0.222	0.042		
Panel B: Correlation matrix– Pearson							
	AC_t	ΔWC_t	ΔNCO_t	ΔFIN_t	ROA_t	ROA_{t+1}	RET_{t+1}
AC_t	1						
ΔWC_t	0.330**	1					
ΔNCO_t	0.663**	0.074**	1				
ΔFIN_t	0.298**	-0.189**	-0.418**	1			
ROA_t	0.287**	0.153**	0.159**	0.094**	1		
ROA_{t+1}	0.154**	0.093**	0.107**	0.017	0.816**	1	
RET_{t+1}	-0.045	-0.028	-0.031	-0.005	0.123**	0.114**	1

**: *Denotes significance at the 0.05 level.*

5.2 Results of Earnings Persistence Tests

Table 3 presents the results of the regression models (8) and (10) using panel data. The Hausman test result advocates choosing the fixed effects model. According to panel A, persistence coefficient on AC (-0.057) is statistically negative at the 0.01 level. This result shows that the persistence coefficient on accruals is lower than the persistence coefficient on cash flows. This result validates our first hypothesis (H_1) and corroborates Richardson et al.'s results (2005) on the U.S. context regarding the magnitude of bias in measuring accruals component persistence.

Panel B reports the estimation results of model (10). Recall that the ΔWC receives a medium reliability rating, the ΔNCO receives a low/medium reliability rating and the ΔFIN receives a high reliability rating. Since the coefficients γ_2, γ_3 and γ_4 in model (10) measure the difference between persistence coefficient on each component of accruals (ΔWC, ΔNCO and ΔFIN, respectively) and persistence coefficient on cash flows, the coefficients γ_2 and γ_3 are assumed to be statistically negative, while the coefficient γ_4 is assumed to be insignificant. The coefficients on each accruals component are negative. However, ΔWC coefficient (-0.049) is not statistically significant. Hypothesis H_2 is not validated. This result differs from that of Richardson et al. (2005) who show that persistence coefficient on ΔWC is lower than that on CF. This can be explained by the fact that U.S. GAAP need strict prudence in revenue accounting, delaying their recognition in income and may be incompatible with the accountant's professional judgment (Webster & Thornton, 2005). γ_3 and γ_4 coefficients are significantly negative. Thus, hypothesis H_3 ($\gamma_3 < 0$) is accepted and hypothesis H_4 ($\gamma_4 = 0$) is rejected. Generally, these results confirm Richardson et al.'s findings (2005).

Overall, the results suggest that the wide latitude given to Canadian managers to exercise professional judgment in determining accruals does not seem to explain bias in accruals persistence measurement. Indeed, determining current operating accruals needs a manager's professional judgment. However, its persistence coefficient is not statistically different from persistence coefficient on cash flows. In addition, persistence coefficient on financial accruals is lower than persistence coefficient on cash flows. But financial accruals are described as highly reliable.

Table 3. Earnings persistence model regression results

Panel A:

$$ROA_{it+1} = \gamma_0 + \gamma_1 ROA_{it} + \gamma_2 AC_{it} + \upsilon_{it+1}$$

	Intercept	ROA	AC	$\bar{R}^2$	F- Stat
Estimated coefficient	0.027***	0.209***	-0.057***	0.636	9.46***
(t-Statistic)	(9.27)	(4.00)	(-2.78)		
Fisher test :	F (388, 412) = 2.92		Prob >F = 0.000		
Hausman test :	chi2 (2) = 135.95		Prob > chi2 = 0.000		

Panel B:

$$ROA_{it+1} = \gamma_0 + \gamma_1 ROA_{it} + \gamma_2 \Delta WC_{it} + \gamma_3 \Delta NCO_{it} + \gamma_4 \Delta FIN_{it} + \upsilon_{it+1}$$

	Intercept	ROA	ΔWC	ΔNCO	ΔFIN	$\bar{R}^2$	F- Stat
Estimated coefficient	0.027***	0.208***	-0.049	-0.060**	-0.055**	0.631	4.72***
(t-Statistic)	(8.91)	(3.97)	(-1.10)	(-2.43)	(-2.05)		
Fisher test :	F (388, 410) = 2.89			Prob >F = 0.000			
Hausman test :	chi2 (2) = 138.26			Prob > chi2 = 0.000			

***, ***: Denote significance at the 0.05 and 0.01 level, respectively*

5.3 Results of Mispricing Tests

The latter hypothesis is to test whether the Canadian investor correctly anticipates degree of persistence of the various earnings components. It stipulates that investors do not take into account low persistence of the less reliable accruals components in their anticipation of future earnings and adjust their forecasts in the subsequent period after reversal of these accruals. This implies a negative relationship between these components and the subsequent abnormal returns. To test this hypothesis, we estimate models (11) and (12) using panel data. Table 4 reports the results of the regression models using quasi-generalized least squares (QGLS). The Breusch & Pagan test shows the existence of heterogeneity. The Hausman test statistic requires using the error components model.

Panel A of table 4 presents the estimation results of model (11). The significant negative relationship between abnormal returns and total accruals shows that Canadian investors overestimate persistence of accruals. This result confirms the presence of "accruals anomaly" in the Canadian stock market.

The results presented in panel B show that Canadian investors overvalue persistence of accruals components estimated as low persistence (ΔNCO and ΔFIN). Indeed, ΔFIN and ΔNCO coefficients are significantly negative. Richardson et al. (2005) find that ΔWC and ΔNCO coefficients are the most negative, showing that the less reliable components are the most overvalued by U.S. investors. On the other hand, in the Canadian context, investors overestimate the ΔFIN component considered of high reliability and properly evaluate ΔWC considered of medium reliability. These results show that Canadian investors do not only overstate accruals components considered of low reliability.

Unlike the U.S. context, our results show that the low reliability of accruals seems to partially explain accruals anomaly in a context marked by wide latitude granted to managers in their professional judgment to determine accruals. This result supports Skinner's disagreement (1995) with idea that principles-based GAAP produces financial information that can be misleading.

Table 4. Mispricing model regression results

Panel A :

$$RET_{it+1} = \gamma_0 + \gamma_1 ROA_{it} + \gamma_2 AC_{it} + \vartheta_{it+1}$$

	Intercept	ROA	AC	$\bar{R}^2$	Wald chi2
Estimated coefficient	-0.101***	0.031***	-0.017**	0.020	13.48***
(t-Statistic)	(-5.79)	(3.37)	(-2.34)		
Breusch & Pagan test:	chi2 (1) = 4.25				Prob > chi2 = 0.039
Hausman test:	chi2 (2) = 1.85				Prob > chi2= 0.397

Panel B :

$$RET_{it+1} = \gamma_0 + \gamma_1 ROA_{it} + \gamma_2 \Delta WC_{it} + \gamma_3 \Delta NCO_{it} + \gamma_4 \Delta FIN_{it} + \vartheta_{it+1}$$

	Intercept	ROA	ΔWC	ΔNCO	ΔFIN	$\bar{R}^2$	Wald chi2
Estimated coefficient	-0.010***	0.032***	-0.019	-0.016**	-0.017*	0.018	13.54***
(t-Statistic)	(-5.74)	(3.38)	(-1.13)	(-1.98)	(-1.70)		
Breusch & Pagan test:	chi2 (1) = 3.96						Prob > chi2 = 0.047
Hausman test:	chi2 (2) = 7.20						Prob > chi2= 0.126

, **, *: Denote significance at the 0.1, 0.05 and 0.01 level, respectively.*

6. Summary

This paper has two objectives. First, we examine whether low reliability of some accruals components can explain low earnings persistence by examining the Canadian context which is characterized by high managerial discretion. By decomposing accruals in terms of current operating accruals, non-current operating accruals and financial accruals, we examine their reliability and tested their persistence relative to cash flows. Second, we test whether Canadian investors overestimate persistence of low reliability accruals components. If Canadian investors overestimate persistence of low reliability accruals components, they will adjust their forecasts in the next period following reversal of accruals.

The empirical tests focus on a sample of 803 firm-year observations from Canadian firms listed on the Toronto Stock Exchange over the period 2002-2005. The results show that the two components of accruals ignored by the definition of Healy (1985), i.e. non-current operating accruals and financial accruals, have lower persistence coefficients than cash flows. However, non-current operating accruals are described as low reliability and financial accruals as high reliability. Low reliability of some accruals components seems to partially explain low earnings persistence. In addition, the results reveal that Canadian investors overvalue persistence not only of low reliability accruals components, but also some accruals with high reliability. They overestimate non-current operating accruals persistence described as low reliability, and financial accruals considered as high reliability. Thus, accruals' low reliability seems to partially explain the "accruals anomaly" detected in the Canadian stock market. Finally, the wide latitude granted to managers to exercise their professional judgment, marking Canadian GAAP, does not seem to be the right explanation of accruals lower persistence, or the main cause of overvaluing accruals persistence by Canadian investors.

Finally, it should be noted that our analysis is subject to numerous limitations and a number of extensions could be made. Our sample does not include all publicly traded Canadian firms and our conclusions are dependent on the sample that we studied, which consists mainly of large firms. Also, additional analysis of discretionary and non discretionary components of accruals would be more enriching to examine the relationship between managers' professional judgment, low reliability of accruals and bias in measuring earnings persistence.

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Notes

Note 1. To illustrate the problem of measurement errors, Richardson et al. (2005, p. 441) cite the example of the recognition of sales revenue. If credit sales amounted to $ 110 in year t, of which $ 100 will actually be collected during the year t +1, there is uncertainty regarding the amount to be recognized in the year t. An aggressive manager could book sales of $ 110, representing a margin of error of $ 10 while determining accruals, and therefore while determining earnings of year t. Conversely, a conservative manager could book sales of $ 90, representing an error margin of $ -10 while determining accruals and earnings for the year t.

Market Sentiment Deterioration and Stock Returns: The Case of the Japanese Electric Appliances Industry

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Abstract

This paper aims to clarify the characteristics of the return dynamics of the Japanese electric appliances industry stocks in markets with deteriorated investor sentiment. The contributions derived by our empirical analysis are as follows. First, this paper newly clarifies that high beta stocks show conjunctional behavior when investor sentiment is deteriorated in stock markets. Second, we also clarify that high size stocks also exhibit conjunctional behaviors in markets with deteriorated sentiment. Moreover, we further demonstrate that the conjunctional behaviors of high beta stocks and high size stocks do not have the same behavioral characteristics in markets with extremely declined investor sentiment.

Keywords: high beta stocks, implied volatility, investor sentiment, high size stocks

1. Introduction

Investor sentiment in financial markets is more and more paid attention to by academic researchers and practitioners. Representative academic researches with respect to this market sentiment were implemented by such studies as Lee et al. (1991), Barberis et al. (1998), Neal and Wheatley (1998), Daniel et al, (1998), Baker and Wurgler (2006), and Baker and Wurgler (2007). In addition, many new researches follow the above studies as seen in Tsuji (2006), Kurov (2010), Berger and Turtle (2012), Baker et al. (2012), Alimov and Mikkelson (2012), and Stambaugh et al. (2012). However, as far as we know, there seems to be little study which investigates the stock return dynamics when market sentiment is deteriorated. Focusing on this point, therefore, this paper aims to clarify the characteristics of return dynamics of the Japanese equities when market sentiment is deteriorated. This is our main objective of this paper. We focus on the Japanese electric appliances industry stocks because this is one of the most representative industries in Japan.

Our contributions in this paper are as follows. First, this paper newly clarifies that high beta stocks show conjunctional behavior when investor sentiment is deteriorated in stock markets. Second, we also clarify that large size stocks also exhibit conjunctional behavior when market sentiment is extremely declined. In addition, we further demonstrate that the conjunctional behaviors of high beta stocks and big size stocks do not have the same behavioral characteristics in markets with deteriorated investor sentiment.

The rest of the paper is organized as follows. First, Section 2 conducts literature review, Section 3 explains data and model, Section 4 presents the empirical results and interpretations, and Section 5 summarizes the paper.

2. Literature Review

This section briefly reviews the existing related literature. First, Barberis et al. (1998) and Daniel et al. (1998) build models of investor sentiment, and Lee et al. (1991) analyze the relation between investor sentiment and the closed-end fund puzzle. Further, Neal and Wheatley (1998), Baker and Wurgler (2006, 2007), Tsuji (2006), Berger and Turtle (2012), Baker et al. (2012), and Stambaugh et al. (2012) perform empirical analysis of investor sentiment in stock markets in general contexts. Above are all interesting and exciting studies, however, as we mentioned, there seems to be little study which investigates the stock return dynamics by focusing on the stock markets with deteriorated investor sentiment.

3. Data and Empirical Model

This section explains the data and our empirical model. Regarding the relations between market sentiment and stock

returns, there would not be perfect theory, thus we later introduce the empirical model. First, the full universe of our data of implied volatility (IV), which is an investor sentiment measure, is from January 5, 1998 to April 28, 2011. Namely, our implied volatility data derived from the Nikkei 225 options (from Osaka University) have daily frequency. By using these IV values and other data, we design our empirical research. To design our research effectively, we focus on extremely high IV dates in our above full samples. More specifically, for our empirical tests, we regard extremely high IV dates as those when IV exceeds the value of 80.0. As displayed from Tables 1 to 4, only 11 days are recognized as extremely high IV dates; namely these eleven days are the dates when market sentiment is deteriorated in our setting.

Table 1. The Results of Regressions: October 16, 27, and 28 in 2008

Panel A Statistics of the Japanese Electric Appliances Industry Stock Returns									
	October 16, 2008			October 27, 2008			October 28, 2008		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
	−10.193	−18.957	1.036	−6.677	−26.667	5.213	8.027	−7.216	24.316
	SD.	Skewness	Kurtosis	SD.	Skewness	Kurtosis	SD.	Skewness	Kurtosis
	4.411	0.381	2.642	4.857	−0.447	4.727	6.080	0.220	3.151
Panel B Estimation Results									
	October 16, 2008			October 27, 2008			October 28, 2008		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant	−5.681*	11.088**	9.175*	3.290	12.077**	11.300*	9.753**	−14.241*	−15.934*
p-value	0.067	0.033	0.088	0.351	0.035	0.059	0.049	0.087	0.055
BETA	−5.019***		−4.073***	−2.164		−1.638	−1.123		−2.856
p-value	0.001		0.006	0.190		0.327	0.585		0.178
SIZE		−1.471***	−1.237***		−0.786**	−0.709*		2.024***	2.178***
p-value		0.000	0.001		0.045	0.078		0.000	0.000
BM	0.387	−1.547**	−0.748	−1.653	−2.441**	−2.121*	−1.013	0.083	0.718
p-value	0.605	0.032	0.352	0.127	0.012	0.065	0.296	0.924	0.472
VOL	0.015	0.196*	0.184*	−0.024	0.058	0.058	0.027	−0.335	−0.335
p-value	0.854	0.069	0.080	0.783	0.485	0.479	0.799	0.150	0.144
TDTA	0.007	−0.036	−0.007	−0.043	−0.061**	−0.049	0.023	0.027	0.050
p-value	0.823	0.230	0.829	0.238	0.046	0.169	0.646	0.549	0.284
LAR	0.021	0.016	0.013	−0.002	−0.006	0.006	0.040	0.054	0.055
p-value	0.662	0.741	0.760	0.964	0.907	0.914	0.508	0.355	0.336
CFPS	−0.003*	−0.001	−0.001	−0.001	0.000	0.000	0.000	−0.003	−0.003
p-value	0.088	0.476	0.564	0.833	0.887	0.857	0.974	0.222	0.241
BEP	−0.006	−0.204	−0.082	−0.335*	−0.420***	−0.363**	−0.061	−0.046	0.058
p-value	0.963	0.118	0.532	0.053	0.008	0.042	0.750	0.767	0.748
Adj. R^2	0.121	0.135	0.190	0.074	0.088	0.087	−0.028	0.079	0.085
Obs.	116	116	116	116	116	116	116	116	116

Notes: We use the data of the Japanese electric appliances industry and implied volatilities derived from the Nikkei 225 options. Our full samples are 3,274 and the full daily sample period is from January 5, 1998 to April 28, 2011. We regard the markets when IV exceeds 80.0 as stock markets with deteriorated sentiment, and we perform the cross-sectional regressions for the days when market sentiment is deteriorated. Model 1 examines the beta effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Model 2 tests the size effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Further, Model 3 examines both beta and size effects with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. In panel A, 'Min.' denotes minimum value, 'Max.' denotes maximum value, and 'SD.' denotes standard deviation, respectively. In panel B, 'Constant' denotes constant term, BETA denotes the beta values of sample firms, SIZE means the market capitalization values of sample firms, BM denotes the book-to-market ratios of sample firms, and VOL means the yen trading volumes of sample firms. Further, TDTA means debt ratios of sample firms, LAR denotes the short-term liquidity to total asset ratios of sample firms, CFPS means the cash-flow per share, and BEP denotes EBITs to total asset ratios. Moreover, Adj. R^2 denotes the adjusted *R*-squared values and Obs. means the number of samples in our cross-sectional regressions. Further, we use the method of White (1980), thus *p*-values are robust to the heteroskedasticity of the error terms of regressions. *** denotes the statistical significance at the 1% level, ** denotes the statistical significance at the 5% level, and * denotes the statistical significance at the 10% level, respectively.

Table 2. The Results of Regressions: October 29, 30, and 31 in 2008

Panel A Statistics of the Japanese Electric Appliances Industry Stock Returns									
	October 29, 2008			October 30, 2008			October 31, 2008		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
	5.759	−9.028	20.253	7.772	−3.049	22.346	−2.536	−19.540	16.076
	SD.	Skewness	Kurtosis	SD.	Skewness	Kurtosis	SD.	Skewness	Kurtosis
	5.526	0.265	3.261	4.332	0.079	3.725	4.476	−0.119	5.948
Panel B Estimation Results									
	October 29, 2008			October 30, 2008			October 31, 2008		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant	7.549**	−5.915	−4.629	5.448*	−7.126	−5.290	1.346	22.456***	20.375***
p-value	0.022	0.436	0.547	0.060	0.230	0.382	0.633	0.000	0.000
BETA	3.069*		2.254	3.679***		2.965**	−4.835***		−3.529**
p-value	0.094		0.217	0.006		0.025	0.001		0.013
SIZE		1.147**	1.023*		1.076***	0.899**		−1.816***	−1.629***
p-value		0.028	0.055		0.006	0.024		0.000	0.000
BM	−1.873**	−0.518	−1.014	−1.175*	0.306	−0.384	0.600	−1.588**	−0.742
p-value	0.024	0.526	0.284	0.091	0.632	0.617	0.367	0.013	0.302
VOL	−0.156	−0.330***	−0.327***	−0.009	−0.164	−0.156	−0.091	0.162	0.159
p-value	0.272	0.004	0.004	0.928	0.143	0.170	0.548	0.139	0.156
TDTA	−0.035	−0.004	−0.021	0.005	0.041	0.017	−0.002	−0.048	−0.019
p-value	0.316	0.909	0.552	0.866	0.199	0.607	0.943	0.126	0.566
LAR	−0.093**	−0.086*	−0.086*	−0.003	0.004	0.003	0.053	0.040	0.042
p-value	0.037	0.067	0.057	0.944	0.925	0.938	0.198	0.249	0.244
CFPS	0.006***	0.004**	0.004*	0.002	0.001	0.001	−0.000	0.002	0.002
p-value	0.010	0.047	0.055	0.285	0.521	0.607	0.963	0.595	0.570
BEP	0.053	0.193	0.112	−0.020	0.133	0.028	−0.074	−0.276**	−0.146
p-value	0.749	0.219	0.520	0.876	0.323	0.832	0.588	0.031	0.277
Adj. R^2	0.174	0.195	0.198	0.080	0.087	0.109	0.126	0.214	0.246
Obs.	116	116	116	116	116	116	116	116	116

Notes: We use the data of the Japanese electric appliances industry and implied volatilities derived from the Nikkei 225 options. Our full samples are 3,274 and the full daily sample period is from January 5, 1998 to April 28, 2011. We regard the markets when IV exceeds 80.0 as stock markets with deteriorated sentiment, and we perform the cross-sectional regressions for the days when market sentiment is deteriorated. Model 1 examines the beta effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Model 2 tests the size effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Further, Model 3 examines both beta and size effects with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. In panel A, 'Min.' denotes minimum value, 'Max.' denotes maximum value, and 'SD.' denotes standard deviation, respectively. In panel B, 'Constant' denotes constant term, BETA denotes the beta values of sample firms, SIZE means the market capitalization values of sample firms, BM denotes the book-to-market ratios of sample firms, and VOL means the yen trading volumes of sample firms. Further, TDTA means debt ratios of sample firms, LAR denotes the short-term liquidity to total asset ratios of sample firms, CFPS means the cash-flow per share, and BEP denotes EBITs to total asset ratios. Moreover, Adj. R^2 denotes the adjusted *R*-squared values and Obs. means the number of samples in our cross-sectional regressions. Further, we use the method of White (1980), thus *p*-values are robust to the heteroskedasticity of the error terms of regressions. *** denotes the statistical significance at the 1% level, ** denotes the statistical significance at the 5% level, and * denotes the statistical significance at the 10% level, respectively.

Based on the above design, by also using return data and other market and accounting data (They are from Nikkei Inc.), we perform the cross-sectional regressions. Regarding accounting data, we use the data which are published at least six month before the dates of our cross-sectional regressions for the days when sentiment is extremely declined. We take the time span of six months because it needs time for market participants to understand the companies' financial conditions. Further, with respect to return data, they are 116 Japanese electric appliances industry firms' returns, and these firms are listed in the Tokyo Stock Exchange (TSE) First Section. Currently, the largest number of the electric appliances industry firms is included in the Tokyo Stock Price Index (TOPIX). Thus we consider that this industry is highly important for the Japanese equity markets, and thus we use these companies' data in this paper.

Writing our empirical model of cross-sectional regression in full form, the formula is as follows:

$$RET_i = \xi_0 + \xi_1 BETA_i + \xi_2 SIZE_i + \xi_3 BM_i + \xi_4 VOL_i + \xi_5 TDTA_i + \xi_6 LAR_i + \xi_7 CFPS_i + \xi_8 BEP_i + \eta_i \quad (1)$$

Where BETA denotes the beta values of sample firms, SIZE means the market capitalization values of sample firms, BM denotes the book-to-market ratios of sample firms, and VOL means the yen trading volumes of sample firms. Further, TDTA means the debt ratios of sample firms, LAR denotes the short-term liquidity to total asset ratios of sample firms, CFPS means the cash-flow per share, and BEP denotes the EBITs to total asset ratios. We use the method of White (1980) thus statistical significance of the coefficients of our regressions is robust to heteroskedasticity of regression error terms.

Table 3. The Results of Regressions: November 4, 7, and 13 in 2008

Panel A Statistics of the Japanese Electric Appliances Industry Stock Returns									
	November 4, 2008			November 7, 2008			November 13, 2008		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
	5.806	−3.751	34.483	−3.560	−17.836	4.615	−4.562	−17.526	5.988
	SD.	Skewness	Kurtosis	SD.	Skewness	Kurtosis	SD.	Skewness	Kurtosis
	5.557	1.613	8.685	3.432	−0.399	4.806	3.520	−0.383	4.535
Panel B Estimation Results									
	November 4, 2008			November 7, 2008			November 13, 2008		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant	1.840	−11.739	−9.315	2.433	10.870**	8.833*	−3.821	7.809*	7.659*
p-value	0.580	0.178	0.301	0.237	0.020	0.063	0.131	0.071	0.096
BETA	4.571**		3.710*	−3.821***		−3.408***	−1.148		−0.228
p-value	0.028		0.089	0.000		0.001	0.442		0.883
SIZE		1.168**	0.934		−0.748**	−0.549		−1.006***	−0.991***
p-value		0.047	0.138		0.040	0.146		0.001	0.001
BM	−1.655***	0.105	−0.777	−0.621	−1.790***	−1.024**	0.378	−0.450	−0.400
p-value	0.009	0.904	0.357	0.152	0.001	0.024	0.464	0.400	0.530
VOL	−0.044	−0.187	−0.176	−0.017	0.098	0.090	−0.198***	−0.003	−0.005
p-value	0.614	0.134	0.164	0.808	0.400	0.453	0.002	0.961	0.942
TDTA	0.061	0.100**	0.072	−0.009	−0.042**	−0.016	−0.003	−0.015	−0.014
p-value	0.272	0.043	0.206	0.643	0.026	0.406	0.909	0.491	0.636
LAR	−0.002	0.007	0.006	0.004	−0.004	−0.002	−0.019	−0.026	−0.026
p-value	0.975	0.911	0.931	0.927	0.922	0.965	0.615	0.435	0.440
CFPS	0.000	−0.001	−0.001	0.002	0.003*	0.003*	−0.000	0.001	0.001
p-value	0.871	0.736	0.646	0.142	0.070	0.052	0.698	0.265	0.275
BEP	−0.086	0.099	−0.026	−0.187	−0.327***	−0.211*	0.084	0.019	0.027
p-value	0.474	0.458	0.836	0.101	0.010	0.064	0.564	0.870	0.850
Adj. R^2	0.114	0.111	0.132	0.121	0.078	0.134	0.016	0.090	0.081
Obs.	116	116	116	116	116	116	116	116	116

Notes: We use the data of the Japanese electric appliances industry and implied volatilities derived from the Nikkei 225 options. Our full samples are 3,274 and the full daily sample period is from January 5, 1998 to April 28, 2011. We regard the markets when IV exceeds 80.0 as stock markets with deteriorated sentiment, and we perform the cross-sectional regressions for the days when market sentiment is deteriorated. Model 1 examines the beta effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Model 2 tests the size effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Further, Model 3 examines both beta and size effects with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. In panel A, 'Min.' denotes minimum value, 'Max.' denotes maximum value, and 'SD.' denotes standard deviation, respectively. In panel B, 'Constant' denotes constant term, BETA denotes the beta values of sample firms, SIZE means the market capitalization values of sample firms, BM denotes the book-to-market ratios of sample firms, and VOL means the yen trading volumes of sample firms. Further, TDTA means debt ratios of sample firms, LAR denotes the short-term liquidity to total asset ratios of sample firms, CFPS means the cash-flow per share, and BEP denotes EBITs to total asset ratios. Moreover, Adj. R^2 denotes the adjusted *R*-squared values and Obs. means the number of samples in our cross-sectional regressions. Further, we use the method of White (1980), thus *p*-values are robust to the heteroskedasticity of the error terms of regressions. *** denotes the statistical significance at the 1% level, ** denotes the statistical significance at the 5% level, and * denotes the statistical significance at the 10% level, respectively.

Table 4. The Results of Regressions: November 20 and 21 in 2008

Panel A Statistics of the Japanese Electric Appliances Industry Stock Returns						
	November 20, 2008			November 21, 2008		
	Mean	Min.	Max.	Mean	Min.	Max.
	−4.706	−12.141	22.989	3.571	−21.495	13.404
	SD.	Skewness	Kurtosis	SD.	Skewness	Kurtosis
	3.928	2.797	22.495	4.081	−1.958	14.167
Panel B Estimation Results						
	November 20, 2008			November 21, 2008		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant	0.715	15.351***	15.096***	4.919**	−2.604	−0.317
p-value	0.782	0.002	0.006	0.028	0.587	0.944
BETA	−1.468		−0.344	3.423**		3.062**
p-value	0.217		0.784	0.010		0.017
SIZE		−1.259***	−1.239***		0.629	0.449
p-value		0.000	0.000		0.121	0.244
BM	−0.038	−1.153***	−1.062**	−1.938**	−0.766	−1.583*
p-value	0.939	0.007	0.035	0.044	0.345	0.080
VOL	−0.153	0.158	0.158	−0.112	−0.232	−0.239
p-value	0.261	0.211	0.212	0.382	0.205	0.193
TDTA	−0.034	−0.049*	−0.046	−0.022	0.006	−0.018
p-value	0.268	0.059	0.141	0.350	0.788	0.447
LAR	0.004	−0.003	−0.003	−0.007	−0.001	−0.004
p-value	0.918	0.926	0.933	0.824	0.973	0.900
CFPS	−0.003**	−0.001	−0.001	0.001	0.000	0.000
p-value	0.043	0.502	0.499	0.506	0.775	0.757
BEP	−0.236	−0.318**	−0.304*	−0.040	0.111	−0.016
p-value	0.148	0.025	0.066	0.745	0.329	0.893
Adj. R^2	0.161	0.250	0.244	0.103	0.079	0.104
Obs.	116	116	116	116	116	116

Notes: We use the data of the Japanese electric appliances industry and implied volatilities derived from the Nikkei 225 options. Our full samples are 3,274 and the full daily sample period is from January 5, 1998 to April 28, 2011. We regard the markets when IV exceeds 80.0 as stock markets with deteriorated sentiment, and we perform the cross-sectional regressions for the days when market sentiment is deteriorated. Model 1 examines the beta effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Model 2 tests the size effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Further, Model 3 examines both beta and size effects with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. In panel A, 'Min.' denotes minimum value, 'Max.' denotes maximum value, and 'SD.' denotes standard deviation, respectively. In panel B, 'Constant' denotes constant term, BETA denotes the beta values of sample firms, SIZE means the market capitalization values of sample firms, BM denotes the book-to-market ratios of sample firms, and VOL means the yen trading volumes of sample firms. Further, TDTA means debt ratios of sample firms, LAR denotes the short-term liquidity to total asset ratios of sample firms, CFPS means the cash-flow per share, and BEP denotes EBITs to total asset ratios. Moreover, Adj. R^2 denotes the adjusted R-squared values and Obs. means the number of samples in our cross-sectional regressions. Further, we use the method of White (1980), thus p-values are robust to the heteroskedasticity of the error terms of regressions. *** denotes the statistical significance at the 1% level, ** denotes the statistical significance at the 5% level, and * denotes the statistical significance at the 10% level, respectively.

More specifically, we perform three types of regressions. First is Model 1, which examines the beta effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Second is the Model 2, which tests the size effect with controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. Finally, Model 3 examines both beta and size effects with again controlling the variables, BM, VOL, TDTA, LAR, CFPS, and BEP. We implement our regressions only for the dates when market sentiment is deteriorated, i.e., when IV exceeds the value of 80.0.

4. Empirical Results and Interpretations

This section describes our empirical results. As we documented, we perform cross sectional regressions by focusing on the dates when market sentiment is deteriorated. First, Table 1 exhibits the regression results of October 16, 27, and 28 in 2008. First, as to October 16, the variables of BETA and SIZE are statistically significant with the same sign as the mean value of returns of all Japanese electric appliances industry firms on the day in Models 1 and 2.

These results do not change in Model 3, which includes both BETA and SIZE in our regression. This means that high beta firms and large size stocks move to the same direction on the day when market sentiment is deteriorated. Further, as to the results of October 27 and 28 in 2008, the same strong results especially for big size stocks are recognized.

Second, Table 2 demonstrates the regression results as to October 29, 30, and 31 in 2008. This table shows that similar and stronger results as those in Table 1. That is, the variables of BETA and SIZE are statistically significant with the same sign as the mean value of returns of all Japanese electric appliances industry firms on those days in Models 1, 2, and 3. Only one exception is the result for BETA in Model 3 of October 29, 2008. Hence Table 2 strongly indicates that high beta firms and large size stocks move to the same direction with conjunctional behavior when market sentiment is extremely declined.

Furthermore, Tables 3 and 4 display the regression results as to November 4, 7, 13, 20, and 21 in 2008. These tables show the similar results as those in Tables 1 and 2. Namely, again the variables of BETA and SIZE are statistically significant with the same sign as the mean value of returns of all Japanese electric appliances industry firms on those days in Models 1, 2, and 3 although some exceptions exist. Therefore, our empirical results shown in Tables 1 to 4 indicate that high beta firms and large size stocks move with showing conjunctional behavior when market sentiment is deteriorated. Further, we can also interpret that high beta stocks and large size firms show some different conjunctional behavior because often both variables of BETA and SIZE are simultaneously significant in Model 3 in Tables 1 to 4.

5. Conclusions

This paper explored the characteristics of stock return dynamics of the Japanese electric appliances industry when market sentiment is deteriorated. The investigations in this paper derived the following novel contributions.

1. First, this paper newly clarified that high beta stocks presented conjunctional behavior when investor sentiment is deteriorated in stock markets.

2. Second, we clarified that high size stocks also exhibited conjunctional behavior in markets with extremely declined investor sentiment.

3. Furthermore, we also demonstrated that the conjunctional behavior of high beta stocks and high size stocks did not have the same behavioral characteristics in markets with deteriorated investor sentiment.

As above, our novel findings demonstrated in this paper will contribute to the body of academic researches of financial economics. We consider that future related works using our findings and related data may be also valuable, and these works are our future tasks.

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Operational Value-at-Risk in Case of Zero-inflated Frequency

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Abstract

In this paper we analyze operational risk in case of zero-inflated frequency data. We show that standard Poisson distribution does not suit correctly excess zero counts data. Alternatively, Zero-inflated Poisson (ZIP) distribution fits better such data. To assess the benefits of the use of ZIP distribution on operational risk management, we develop two separate aggregate distributions. The first one is based on standard Poisson distribution and the second on ZIP distribution. Note that the severity model is the same for both aggregations. Results show that operational capital charge based on standard Poisson distribution is underestimated by 5% at a very high level of confidence (99.99%).

Keywords: operational risk, lda, poisson distribution, excess zeros, over-dispersion, zero-inflated poisson distribution, capital charge, basel ii accord

1. Introduction

In 1995, Barings bank (233 years) collapsed because of unauthorized speculations led by the trader Nick Leeson (Fay, 1996). This event was a starting point for intensified works related to operational risk initiated by Basel committee on banking supervision (BCBS). As a result, several definitions of operational risk had emerged (Eladlouni, Ezzahid and Mouatassim, 2011). The British Bankers Association, for example, defines operational risk as the "risk associated with human error, inadequate procedures and control, fraudulent criminal activities; the risks caused by technological shortcomings, system breakdowns; all risks which are not "banking" and arise from business decisions as competitive actions, pricing, etc.; legal risk and risk to business relationships, failure to meet regulatory requirements or an adverse impact on the bank's reputation; "external factors" including natural disasters, terrorist attacks and fraudulent activity, etc." (Britich Bankers Association, 1997).

The definition provided by BCBS (2001b) is the most popular. It defines operational risk as "the risk of loss resulting from inadequate or failed internal processes, people, systems, or from external events". It includes legal risk but excludes strategic, reputational and systematic risks. These definitions reveal the complexity of operational risk because of its various types and causes. To face this heterogeneity, BCBS (in its document Basel II) identified seven types of operational risk: "**i.** Internal fraud: an act intended to defraud, misappropriate property or avoid regulations, law or company policy, excluding diversity/discrimination events, which involve at least one internal party, **ii.** External fraud: an act of a type intended to defraud, misappropriate property or circumvent the law, by an external party, **iii.** Employment practices and workplace safety: an act inconsistent with employment, health or safety laws or agreements, from payment of personal grievance claims, or from diversity/discrimination events, **iv.** Clients, products, and business practices: an unintentional or negligent breakdown to meet a professional obligation to specific clients (including fiduciary and suitability requirements), or from the nature or design of a product, **v.** Damage to physical assets: the loss or damage to physical assets from natural disaster or other events, **vi.** Business disruption and system failures: disruption of business or system failures, and **vii.** Execution, delivery, and process management: failed transaction processing or process management, from relations with trade counterparties and vendors…" (Eladlouni, Ezzahid and Mouatassim, 2011, p. 100).

In Basel II framework, BCBS recommended to banks to develop more adequate techniques to identify, assess, control and mitigate the consequences of operational risk. In pillar I of Basel II, BCBS recommended to banks to determine the minimum capital requirements commensurate with their exposition to risks. For this reason, BCBS proposed three approaches: **1.** The Basic Indicator Approach (BIA), **2.** The Standardized Approach (SA), **3.** The

Advanced Measurement Approach (AMA). The basic indicator approach is based on flat percentage (15%) of positive gross income over the past three years. Under the standardized approach, banks are required to hold capital charge for each business line. Banks' activities are divided into eight business lines: **i.** Corporate finance, **ii.** Trading and sales, **iii.** Retail banking, **iv.** Commercial banking, **v.** Payment and settlements, **vi.** Agency services, **vii.** Assets' management, **viii.** Retail brokerage. A flat percentage, ranging from 12% to 18%, is applied to the three-years average positive gross income for each business line (Panjer, 2006). The aggregate minimum capital is the sum over all business lines.

The Advanced Measurement Approach (AMA) is based on the collected internal and external loss data. For a bank intending to use the AMA, it is required to prove, for each Basel II 56 risk cells (eight business lines × seven risk types), its ability to estimate unexpected losses based on the combined utilization of four sources of data: **i.** Internal loss data, **ii.** External data, **iii**. Scenario analysis, **iv.** Business environment and internal control factors (BEICFs). The AMA can be implemented via one of the four subsequent techniques: **i.** Scorecard Approach (SCA), **ii.** Scenario-Based AMA (sbAMA), **iii.** Internal Measurement Approach (IMA), **iv.** Loss Distribution Approach (LDA) (Karam and Planchet, 2011). Among these techniques, the LDA is the most used. It belongs to the family of probabilistic methods.

In this paper, we will focus on the LDA. To simplify the notation, we shall present LDA for one class of risk which is determined by one Basel II risk cell. Mathematical formulation of LDA necessitates the definition of a random sum of individual losses:

$$S = \sum_{i=1}^{N(t)} X_i \tag{1}$$

Where S is the aggregate loss, $N(t)$ the number of losses occurring during the period t, and X_i the severity of the i[th] individual loss. Note that $N(t)$ and X_i are assumed to be random. The formula (1) shows that the aggregate loss can be decomposed into two variables the frequency and the severity of a loss.

In LDA, it is assumed that: i. $N(t)$ and $(X_1, X_2, ...)$ are independent random variables, ii. $(X_1, X_2, ...)$ is a set of independent and identically distributed random variables. Under these assumptions, the cumulative distribution' function of S is given by:

$$F_S = P(S \le s) = \begin{cases} \sum_{n=0}^{\infty} P(N(t) = n) F_X^{n*}(s) & if \quad s > 0 \\ P(N(t) = 0) & if \quad s = 0 \end{cases}$$

Where F_X^{n*} is $n - times$ the convolution of F_X with itself, defined by:

$$F_X^{1*} = F_X$$
$$F_X^{n*} = F_X^{(n-1)*} * F_X$$

The mean and variance of S are defined as follows:

$$E(S) = E(N(t)) * E(X)$$

$$Var(S) = E(N(t)) * Var(X) + Var(N(t)) * [E(X)]^2$$

Four methods can be used to obtain the convolution F_S : **i.** the Fast Fourier Transforms (Rioux and Klugman, 2004), **ii.** the Recursive algorithm of Panjer (Panjer, 1981), **iii.** the Monte Carlo Simulation Approach (Rioux and Klugman, 2004), and **iv.** the Single-loss Approximation (Böcker and Klüppelberg, 2005). In practice, the required capital charge is measured as $(1-\alpha)*100$ quantile of the convolution F_S over one year period. This quantile is also called value-at-risk (VaR) defined as follows:

$$VaR_{t+1/t} = F_S^{-1}(\alpha) \tag{2}$$

The total capital charge is obtained by aggregating the one year Value-at-Risk measures across all combinations, based on the compounded losses. To avoid the over estimation of the total capital charge, the correlations between Basel II cells defined within (8 business line × 7 type of risk) should be taken into account (Frachot and al., 2004).

The remaining of this paper is organized as following. The theoretical framework of Zero-inflated Poisson distribution is reviewed in section 2. In section 3, we model operational risk using LDA technique. The type of risk

concerned is Damage to Physical Assets (DPA). The frequency is modeled by Poisson and Zero-inflated Poisson distributions. The severity is modeled by Weibull distribution. Aggregate distributions and capital charge are developed in section 4.

2. Zero-inflated Poisson Distribution Framework

Poisson distribution is usually used to model operational risk events. However, the equality of mean and variance, assumed by Poisson distribution, is rarely confirmed in practice. Over-dispersion, which is an excess of variance from the mean, is due to two causes: heterogeneity of population and excess of zeros. The heterogeneity can be detected when population can be divided into sub-populations which are equi-dispersed. The excess of zeros phenomenon is shown when observed zeros exceed largely what is expected by a statistical distribution. In operational risk, the excess of zeros can be due to two main factors: scarcity of operational losses or the existence of a threshold above from which institutions start to collect losses (Chernobai and al., 2010).

Alternatively, Negative binomial distribution is usually used when over-dispersion is due to heterogeneity of data. However, this distribution remains unable to reproduce the number of observed zeros when data are zero inflated. An alternative way for modeling count events when zeros are preponderant is zero-inflated Poisson distribution (Johnson and Kotz, 1968). This distribution assumes that outcomes are generated by two processes. The first process attempts to model zero inflation outcomes by introducing a proportion of $1-\phi$ for extra zeros and a proportion $\phi e^{-\lambda}$ for zeros from Poisson distribution. The second process models the nonzero outcomes by zero-truncated Poisson distribution.

Let $N(t)$ be the number of operational losses occurred during the period t. Johnson and Kotz (1968) defined Zero-inflated Poisson distribution for the sequence $(N(t))_{0\le t\le T}$ as follows:

$$P(N(t)=n)=\begin{cases}(1-\phi)+\phi e^{-\lambda} & if \quad n=0\\ \phi\lambda^n\dfrac{e^{-\lambda}}{n!} & if \quad n>0\end{cases} \tag{3}$$

The mean and the variance of the Zero-inflated poisson (ZIP) distribution are given by: $E[N(t)]=(1-\phi)\lambda$ and $Var[N(t)]=(1-\phi)(\lambda+\phi\lambda^2)$. Johnson and Kotz (1968) have proposed different approaches using the method of moments for estimating the parameter ϕ. Martin and Katti (1965) have used the maximum likelihood method to estimate the parameters of ZIP distribution. In this paper, maximum likelihood method is used for obataining the estimated values of λ and ϕ . The likelihood function is:

$$L(\lambda,\phi)=\prod_{k=0}\left(\phi+(1-\phi)e^{-\lambda}\right)\prod_{k>0}(1-\phi)\lambda^k\frac{e^{-\lambda}}{k!} \tag{4}$$

Suppose that N is the number of outcomes and N_0 is the number of zeros in the data. The likelihood becomes:

$$L(\lambda,\phi)=\left(\phi+(1-\phi)e^{-\lambda}\right)^{N_0}(1-\phi)^{(N-N_0)}\prod_{n>0}\lambda^n\frac{e^{-\lambda}}{n!} \tag{5}$$

The log likelihood is:

$$\ln L(\lambda,\phi)=N_0\ln\left(\phi+(1-\phi)e^{-\lambda}\right)+(N-N_0)[\ln(1-\phi)-\lambda]+\ln(\lambda)\sum_{n>0}n-\sum_{n>0}\ln(n!) \tag{6}$$

The equilibrium conditions are:

$$\frac{\partial}{\partial\lambda}\ln L(\lambda,\phi)=-N_0\frac{(1-\phi)e^{-\lambda}}{\phi+(1-\phi)e^{-\lambda}}-(N-N_0)+\frac{\sum_{n>0}n}{\lambda}=0 \tag{7}$$

$$\frac{\partial}{\partial\phi}\ln L(\lambda,\phi)=N_0\frac{1-e^{-\lambda}}{\phi+(1-\phi)e^{-\lambda}}-(N-N_0)\frac{1}{(1-\phi)}=0 \tag{8}$$

Dividing the equation (7) by (8):

$$\frac{\lambda}{1-e^{-\lambda}} = \frac{\sum_{k>0} n}{N - N_0} = \frac{N\bar{n}}{N - N_0} \tag{9}$$

It is clear that equation (9) is only function of λ. Hence, numerical algorithms can be used to find the estimated value of λ, denoted by $\hat{\lambda}$. The estimated value of ϕ, denoted by $\hat{\phi}$, is then determined easily by replacing λ, in (7) or (8), by its estimated value $\hat{\lambda}$.

Singh (1963) found the following formulas:

$$Var\left(\hat{\lambda}\right) \cong (1-\phi)^{-1}\lambda\left(1-e^{-\lambda}\right)\left(1-e^{-\lambda}-\lambda e^{-\lambda}\right)^{-1} \tag{10}$$

$$Var\left(\hat{\phi}\right) \cong (1-\phi)\left[\phi\left(1-e^{-\lambda}\right)+(1-\phi)e^{-\lambda}\right]\left(1-e^{-\lambda}-\lambda e^{-\lambda}\right)^{-1} \tag{11}$$

Yoneda (1962) and Johnson and Kotz (1968) have extended the zero-inflated Poisson distribution. They developed a general modified Poisson distribution. Under this distribution, any kind of excess in frequency data is allowed, that is the values $n = 0,1,2,...,K$ are inflated counts while the remaining values $n = K+1, K+2,...,N$ follow a Poisson process (Johnson and al., 1992).

Lambert (1992) has introduced covariates into Zero-inflated Poisson distribution and has fitted it to defects in manufacturing data. Recently, Lambert's model, called also Zero-inflated Poisson regression, becomes largely used in many fields such as public health, epidemiology, psychology and others.

3. Operational Risk Modeling

In this section, we develop LDA model for Damage to Physical Assets (DPA). The data set contains daily internal events from March 21, 2007 through February 01, 2009. We ignore the notion of business line because of scarcity of data. Table 1 shows some descriptive statistics of our data.

Table 1. Descriptive statistics

Statistics	Freq.	Severity
Minimum	0.00	1.22 E+003
Maximum	5.00	3.32 E+005
Mean	0.65	4.80 E+004
Standard deviation	1.09	4.06 E+004
Median	0.00	4.41 E+004
Coefficient of variation	1.68	0.84
Skewness coefficient (Cs)	2.02	2.56
Kurtosis coefficient (Ck)	4.04	12.19

To compute capital charge using LDA technique, we have to model separately frequency and severity of operational losses. For frequency modeling, we fit Poisson distribution and Zero-inflated Poisson distribution. The severity, in its turn, is modeled using Weibull distribution. The convolution is determined using the Monte Carlo Simulation Approach.

3.1 Modeling Operational Risk Frequency

The mean of DPA frequency is 0.654 and the variance is 1.20. We note that the variance is greater than the mean. This fact is called over-dispersion in counts data modeling. Since the histogram (see figure1) is highly picked at zero values, we conclude that our DPA frequency is zero inflated. The histogram shows, also, that the ZIP distribution expects the number of zeros value better than the standard Poisson distribution. To determine an appropriate distribution for data, we use two Goodness-of-Fit Tests: QQ plot test and Kolmogorov-Smirnov (KS) test. The first one is graphical and the second is analytical. These tests allow testing the equality of the distributions of two

samples. The hypotheses are defined as follows:

H_0: $N(t)$ follows theoretical distribution fitted to data.

H_1: $N(t)$ does not come from theoretical distribution fitted to data.

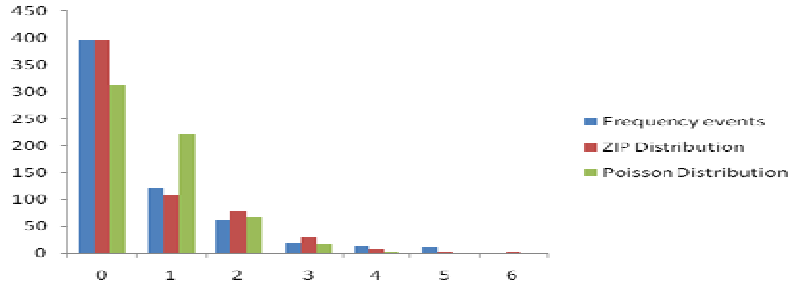

Figure 1. Histogram of DPA frequency

Figure 2 shows the results of QQ plot test. Based on this test, we can state that ZIP distribution fits frequency data better than the standard Poisson distribution.

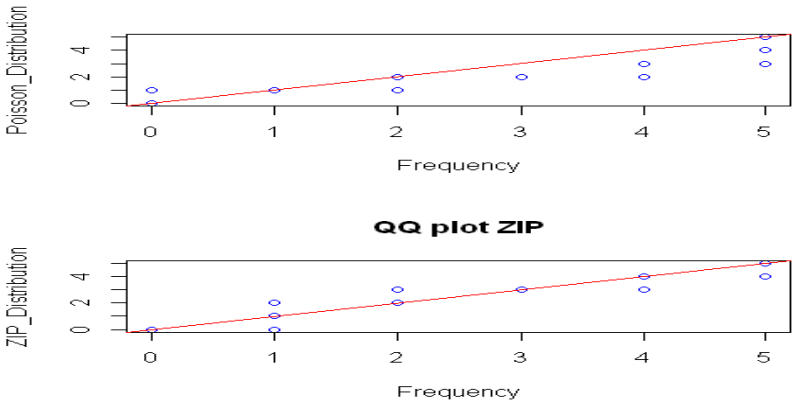

Figure 2. QQ plot tests

To support or deny analytically the results carried out by QQ plot test, we use KS test which tests the equality of empirical distribution and a candidate theoretical distribution. If the P-value associated is lower than significance level (here 5%), H_0 is rejected. If P-value is greater than significance level test (here 5%), we can state that sample data comes from the candidate distribution.

Table 2 shows that the occurances of Damage to capital assets does not come from standard Poisson distribution since the P-value associated to KS test (P-value=0.006073) is lower than 5%. However, the KS test (P-value=0.9333) leads to the equality of the empirical distribution of frequency data and ZIP distribution (with parameters mu = 1.3244026 and sigma = 0.5064397).

Table 2. Kolmogorov Smirnov test

Distribution	***statistic***	***P-value***
Poisson	D = 0.0966	0.006073
ZIP	D = 0.0306	0.9333

Based on both tests (QQ plot and KS test) and referring to the histogram, we can state that frequency data with excess of zeros are bad fitted by standard Poisson distribution. In such case, standard Poisson distribution is unable

to reproduce the observed number of zeros in the sample. It underestimates the observed dispersion. In contrary, the number of expected zeros generated by Zero-inflated Poisson distribution is close to the number of observed zeros. This power of ZIP distribution emanates from the fact that it assumes a model for zero outcomes and another model for nonzero outcomes.

3.2 Modeling Operational Severity

Lognormal, Gamma, Weibull, Pareto and other continuous parametric distributions can be candidates for fitting the severity of operational risk losses (Frachot, 2001 and Nigel, 2004). If losses are extremes, picks-over-thresholds are used (Gourier and al., 2009). For our data, the QQ plot test (See Figure 3) and KS test (D = 0.0734, P-value = 0.5999) prove that the Weibull distribution is an appropriate distribution for operational risk losses subject of our analysis.

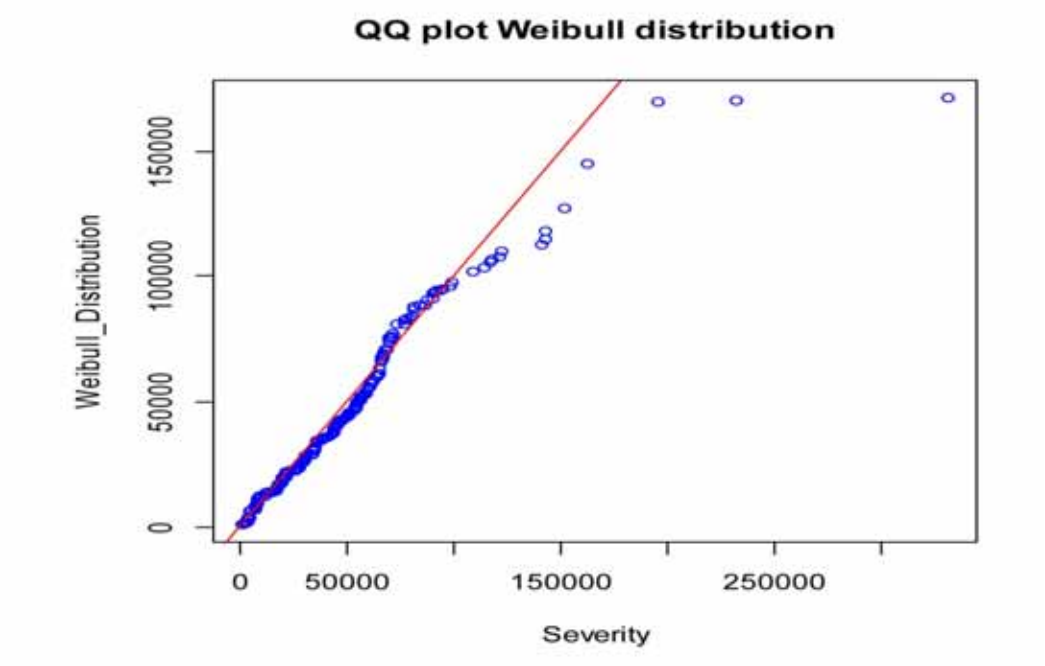

Figure 3. QQ plot test for severity

4. Determination of Capital Charge and Discussion

In this section, we estimate the capital charge a bank needs for facing the expected losses due to Damage to Capital Assets (DPA). The Monte Carlo Simulation Approach is used to calculate the aggregate distribution which combined frequency and severity. The steps of the utilized algorithm are:

Step 1. Generate n number of losses per day using ZIP distribution or Poisson distribution fitted to internal data.

Step 2. Generate n losses severity $X_i(1,2,...,n)$ per day using Weibull distribution fitted to internal data.

Step 3. Repeat Step 1 and Step 2 - 365 times and do the sum of all generated X_i, noted S.

Step 4. The total annual loss based on internal data is S.

Step 5. Repeat *Step1* through *Step 4* a large number of times (*1.000.000*) for obtaining the aggregate distribution of total loss.

Step 6. The VaR is then calculated as $(1-\alpha)*100$ quantile of the empirical distribution of total losses.

To assess the impact of ZIP distribution on the operational capital charge, we constitute two aggregate distributions. The difference between them relies in the distribution of frequency data. The first aggregate distribution is determined by standard Poisson and Weibull distributions whereas the second is a combinaison of ZIP and Weibull distributions.

Table 3. VaR for different significance levels

1-α	VaR1: VaR based Poisson	VaR2: VaR based ZIP	Ratio : VaR1/VaR2
99.99%	15 137 520	15 858 978	95%
99.90%	14 577 165	15 143 577	96%
99.50%	14 032 680	14 504 826	97%
99.00%	13 789 075	14 210 949	97%

Table 3 presents the capital charge for DPA risk for a given significance level (Column 1) estimated by aggregate distribution based on standard Poisson distribution (Column 2) and aggregate distribution based on ZIP distribution (Column 3). The fourth column gives the ratio (VaR1/VaR2) in order to show the difference between the two models. The results in table 3 shows that the capital charge issued from aggregate distribution based on standard Poisson distribution is lower than that emanated from model based on ZIP distribution. In addition, the differences increase with tolerance level. At 99.99%, the capital charge based on standard Poisson distribution is 5%-lower than that based on ZIP distribution. Since both aggregate distributions are based on the same model of severity, these differences are due to the distribution used for modeling frequency. As shown above, Standard Poisson distribution underestimates the observed dispersion when data are zero-inflated. Thus, the capital charge calculated using aggregate model based on it is underestimated and cannot reflect the reality of bank's losses.

Other zero-inflated discrete distributions can be utilized for modeling operational risk frequency in the case of the preponderance of observed zeros. We cite for example zero-inflated binomial, zero-inflated negative binomial etc…. Zero-inflated negative binomial distribution, for example, is preferred when data are over-dispersed due to heterogeneity and excess zeros simultaneously.

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The Level of Conservatism in Accounting Policies and Its Effect on Earnings Management

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Abstract

This study investigates the level of conservatism in accounting policies and examines its effect on earnings management for a sample of 259 Jordanian Manufacturing companies during the period 2006-2009. The results indicate that there are differences on the level of conservatism between companies. Furthermore, the results of this study reveal that conservatism and size are negatively related to earnings management, whereas performance found to be positively related to earnings management.

Keywords: earnings management, conservatism, manufacturing companies, Jordan

1. Introduction

Conservatism was a controversial concept in accounting at the beginning of this century and it remains so today. Despite the criticisms leveled against it, conservatism plays an important role in the practice of accounting (Hendriksen, 1982). Descriptions of conservatism range from the extreme caution to anticipate no profits, but anticipate all losses to the more innocuous choice of the lower estimate of future cash flows when two estimates are equally likely (FASB, 1980).

Conservatism appears to have had a role in accounting-income-based management compensation. An optimal performance measure for compensation purposes reflects the effects of the manager's actions on the value of the firm in the compensation period — it is timely (Holmstrom, 1982).

Accounting conservatism is related to the agency argument for the accruals anomaly. For example, the contracting explanation of conservatism maintains that conservatism is used by shareholders, among others, to mitigate the agency problems (Kothari et al., 2008; Raith, 2009). The separation of ownership from control and its consequent agency problems give rise to demand for mechanisms by shareholders of firms to ensure that professional managers act in their (stakeholders) best interests (Fama and Jensen, 1983). Dechow and Skinner (2000) pointed out that earnings management could take place in the form of income smoothing. Using an example of a software company, they elaborate that company managers could use their reporting discretion and defer part of the recognition of sale. This deferring of sales is done in a period where the actual sales exceed the budgeted sales.

Financial reporting plays a fundamental role in this context because financial reports serve as a primary source of information for outside user in both firm valuation and in evaluating managerial performance (Parthasarathy, 2010). The vast literature on earnings management (e.i, Schipper, 1989, Burgstahler and Dichev, 1998) examined the role of financial reporting in providing managers with a natural incentive to cast their performance in an opportunistic behavior. However, to our knowledge, there is little research on the link between conservatism and earnings management, and its importance in better understanding managerial reporting behavior. The current paper concentrates on discussing and analyzing the effects of conservatism on earnings management among firms operating in Jordanian Manufacturing sector for the period from 2006-2009.

In the recent time, the financial market in Jordan suffers from credit crisis; banks played an important role in evaluating companies' assets for lending purposes. Afterwards, it can be concluded that fair value approach might not have been sufficient to present accurate decision about the financial situation of particular company. This study helps in establishing a relationship between the role of accounting conservatism in improving efficiency of debt contracts. Literature review documented that accounting conservatism helped in improving the efficiency of the debt covenant by increasing the ability of accounting information to predict the future (Watts, 2003; Ball and Shivakumar, 2005; Ball et. al, 2008).

The remainder of this study is set out as follows: section 2 reviews previous studies and develops hypotheses based on exciting theories. Section 3 presents the research design and describes the data. Section 4 discusses the results. Section 5 provides a summary to the research findings and presents the main conclusions of the study. Moreover, contributions to the literature and suggestions for future researches are also presented.

2. Literature Review and Hypothesis Development

Prior accounting research has theoretically examined the relationship between earnings management and conservatism. For example Watts (1993, 2003a) suggested that conservatism leads to greater reliability of accruals. Richardson et al. (2005) empirically showed that greater reliability of accruals also increased their persistence in predicting one-year-ahead earnings and returns. Ahmed et al. (2002) and Zhang (2008) indicated that conservatism is used by firms to receive lower borrowing rates in debt contracts through reducing the downside risk of creditors. Recently, Wakil (2011) showed that overall degree of conservatism incrementally increased the persistence of accruals in predicting one-period-ahead earnings. Lafond and Watts (2007) and Lafond and Roychowdhury (2008) provided evidence that lack of conservatism will likely reduce the usefulness of accounting numbers in addressing the issue of agency conflicts between managers and shareholders.

Parthasarathy (2010) examined the relationship between corporate governance and conservatism. She found that as the level of incentive alignment increases, financial statements are reported less conservatively. Accordingly, she highlighted that incentive alignment is a key concept in understanding when conservative reporting is beneficial and when it is redundant. LaFond and Watts (2008) argued that conservative financial reporting is a governance mechanism that reduces the managers' ability to manipulate performance and increases the firm's cash flows.

Kothari et al. (2008) highlighted that high accrual firms having accruals that are managed upwards, and therefore, are more transitory. Conservatism due to compensation contracts constrains management's upward bias in earnings, thereby, making accruals more persistent in predicting earnings. Ahmad et al. (2002), Zhang (2007) and Lobo et al. (2008) reported negative association between conservatism and earnings management. Hence, based on agency theory, it can be hypothesized that:

H: Ceteris paribus, there is a negative relationship between the level of discretionary accruals and the extent of accounting conservatism

Beatty et al. (2007) employed four different measures of conservatism namely the market-to-book ratio, the Basu coefficient, non-operating accruals and the skewness of earnings distribution to create a combined measure of conservatism. Consistent with Beatty et al. (2007) only two proxies will be employed in the current research to measure the level of conservatism, namely, market to book value and non-operating accruals.

The current study employs alternative control variables to examine the relation between conservatism and earnings management; namely, company size, financial leverage, audit size and performance.

3. Research Design

The study examines all manufacturing companies listed on the Amman Stock Exchange (ASE) for the period from 2006 to 2009. The total number of manufacturing companies listed in ASE in 2009 is 89 company. 15 companies are excluded from the study due to insufficient financial data. In addition, 7 of which are deleted due to merger and acquisition activities. Furthermore, 9 outlier observations are deleted before that analysis has been conducted. Consequently, the final sample consists of 259 firm-observations for the companies listed on the ASE for the period 2006-2009.

3.1 Variables of the Study

3.1.1 Dependent Variable: Earnings Management

In this study, accounting accruals approach is used to measure earnings management. In employing the modified Jones' (1991) model, working capital accrual are decomposed into non-discretionary and discretionary accrual. The majority of previous studies have used abnormal accruals (or discretionary accruals, DA) as a proxy for earnings management. Discretionary accruals are used to demonstrate that managers transfer their accounting earnings from one period to

another. That is, discretionary accruals are open to managers' manipulation. Additionally, non-discretionary accruals reflect the non-manipulated accounting accruals items because they are out of managers' control.

The current study uses the cross-sectional modified version of Jones' model (Jones, 1991; and Dechow et al., 1995) to obtain a proxy for discretionary accruals. Dechow et al. (1995) and Guay et al. (1996) argued that the modified Jones model is the most powerful model for estimating discretionary accruals among the existing models. Based on the above argument, DA can be measured as follows:

Total accruals as previously mentioned is the difference between earnings and cash flows from operating activities

$$TACCit = NIit - OCFit \quad (1)$$

Where:

TACCit = total accruals for company *i* in year *t*

NIit = net income before extraordinary items for company *i* in year *t*

OCFit = operating cash flows for company *i* in year *t*

Equation 2 below is estimated for each firm and fiscal year combination

$$TACCit/ Ait\text{-}1 = \alpha1(1/ Ait\text{-}1) + \alpha2(\Delta REVit - \Delta RECit)/Ait\text{-}1 + \alpha3(PPEit / Ait\text{-}1) + e \quad (2)$$

TACCit = total accruals for company *i* in year *t*

Ait-1 = Lagged total asset for company *i*

ΔREVit = change in operating revenues for company *i* in year *t*

ΔRECit = change in net receivables for for company *i* in year *t*

PPEit = gross property, plant and equipment for company *i* in year *t*

α1- α3 = regression parameters

e = error term

Non-discretionary accruals are measured for each year and fiscal year combination using the equation 3 as follows:

$$NDTACCit/ Ait\text{-}1 = \hat{a}1(1/ Ait\text{-}1) + \hat{a}2(\Delta REVit - \Delta RECit) + \hat{a}3\ PPEit + e \quad (3)$$

NDTACCit = non-discretionary accruals for company *i* in year *t*

Ait-1 = Lagged total asset for company *i*

ΔREVit = change in operating revenues for company *i* in year *t*

ΔRECit = change in net receivables for company *i* in year *t*

PPEit = gross property, plant and equipment for company *i* in year *t*

â1- â3 = regression parameters

The Difference between total accruals and the non-discretionary components of accruals is considered as discretionary accruals (DACC) as stated in equation 4

$$DACCit = TACCit - NDACCit \quad (4)$$

DACCit = discretionary accruals for company *i* in year *t*

TACCit = total accruals for company *i* in year *t*

NDTACCit = non-discretionary accruals for company *i* in year *t*

3.1.2 Independent Variable

This subsection presents the independent variable and their employed proxies

3.1.2.1 Expantory Variable-Conservatism

Previous studies on earning management have employed alternative proxies for conservatism. For example, Basu's 1997 model which based on that companies announce bad news before good news, because it is expected that earnings will be more related to stock trading through the period of bad news than good one (Basu, 1997). This means that conservatism does not allow simultaneous admissions of economic events when reporting earnings. Furthermore, previous studies used book to market value as proxy for conservatism (i.e., Ahmad et al., 2002; Zhang, 2007; Lobo et al., 2008). They found that conservatism is negatively related to discretionary accruals. This is in line

with expectations that firms with higher incentive alignment are better performing and therefore would likely have relatively lower book-to-market ratio. Jain & Rezaee, (2004) noted that reducing the ratio of book value to market value to less than one refers to a reasonable level of accounting conservatism.

3.1.2.2 Control Variables

Company Size

Previous studies indicated negative relation between company size and earnings management (Klein 2002; Xie et al., 2003; Abdul Rahman and Ali, 2006). This support the idea that smaller companies are subject to less control from authority and therefore, managers are more likely engage in earnings management activities. In contrast, Moses (1987) argued that earnings management activities increase as the size of company increase.

Performance

Prior research documents that discretionary accrual estimates are correlated with firm performance (Kothari et al., 2005). In the same manner, Bartov et al. (2000) reported that firms experiencing low firm performance have more incentive to engage in earnings management activity. This is because, lower firm performance means higher bankruptcy risk, which in turn will lead to litigation risks. Chen et al. (2006) showed that lower profitability firms have higher behavior of earnings management.

Financial Leverage

Levered companies are less able to practice earnings management because they are under close scrutiny of lenders. Debt covenant violation arguments predict positive association between earning management and financial leverage. Bartov et al. (2000) showed that leverage is positively related to earnings management activities. In contrast, Park and Shin (2003) found that financial leverage is negative and significant related to earnings management. Hamdan et al. (2011) concluded that low-debt companies in Jordan were more conservative.

Audit Size

Several studies have examined whether or not big audit firms, have better financial reporting (Francis et al. 1999; Defond et al., 2002; Krishnan, 2003; Blokdijk et al., 2006). Chung et al. (2003) argued that, to reduce litigation risk, auditors prefer their clients to make conservative accounting choices rather than non-conservative choices. Francis et al. (1999) reported that the level of discretionary accruals is significantly lower for Big 6 clients than for non-Big 6 clients. Francis and Krishnan (1999) stated that income increasing accruals are somewhat more likely to result in reporting conservatism than income decreasing accruals, and that only the Big 6 group of auditors show evidence of reporting conservatism.

Table 1 exhibits the independent variables and their proxies employed in this research.

Table 1. Independent Variables and their Measurements

Independent Variables	**Code**	**Proxies**
Conservatism-Book to market value	B/MV	Firm *i's* equity capital and reserves at the end of *t* to market value at the end of *t*.
Conservatism- Discretionary accruals	TACC	Firm *i's* net income from continued operation minus operating cash flow
Control Variables		
Company size	SIZE	Firm *i's* natural logarithm of total asset
Performance	ROE	Firm *i*'s published after tax profit at the end of *t* divided by total equity at the end of *t*
Leverage	Leverage	Firm *i's* total debt to total asset at the end of *t*
Audit size	Big4	The audit variable measured using a dichotomous variable equal to 1 if the firm *i* is audited by the big 4 audit firms, and 0 otherwise.

3.2 Regression Model

In order to test the study hypotheses, OLS regression analysis is employed

$$DACC = \beta 0 + \beta 1\ B/MV + \beta 2\ Size + \beta 3\ ROE + \beta 4\ Big4 + e$$

Where: DACC = earnings management; β = the regression coefficient, i = 0, 1… 4; B/MV = conservatism; Size, company size; ROE = performance; Big4 = audit size; e = error term.

4. Results

4.1 Descriptive Results

The descriptive analysis for dependent and independent variables of the study are presented in Table 2. As presented in Table 2, the magnitude of absolute value of earnings management in the sample has a small mean 0.133 with standard deviation of 0.197 and the range is from a minimum of 0.0001 to a maximum of 2.158. This indicates that the deviation between companies is quite small. Additionally, this Table exhibits the descriptive analysis for the independent variables used in analysis. The results show that conservatism variable has on average .8237 with a standard deviation of 0.48 and the range is from a minimum of -0.07 to a maximum of 3.24. This indicates that there is a variation between companies in applying conservatism policies.

Table 2. Descriptive Analysis for Earnings Management-Pooled Data

Variables	Mean	Std. Deviation	Minimum	Maximum
EM	0.133	0.197	0.0001	2.158
B/MV	.8327	.48399	-.07	3.24
TACC	0.1112	0.13412	-0.37	0.65
SIZE	9.0190	2.13355	.00	14.00
ROE	1.2844	44.22694	-145.04	536.63
Leverage	.4126	.64615	.00	6.71
AUDIT SIZE	.92	.265	0	1

Table 3 reports the frequency distribution of conservative companies versus npnconservative companies; the result presents a frequency of 187 conservative companies (72.2%) versus 72 nonconservative companies (27.8%). This indicates that companies use conservatism in its accounting policies. This result is consistent with (Ahmad et al., 2002; Penman and Zhang, 2002; Mensah, et al., 2004; Zhan, 2007).

Table 3. Conservative Vs Nonconservative Companies

Classification	Number of Companies	Percentage of Companies
Conservative Companies	187	72.2%
Nonconservative Companies	72	27.8%

Furthermore, Table 4 reports the results of one sample t-test, the result indicates that (t = 25.446, sig = .000) which indicates that there is significant differences between conservative and nonconservative companies.

Table 4. The Result of One Sample t-test

Mean	S.D	t-value	Df	sig
.8355	.48258	25.446	215	.000***

*** Significant at the 1% level

4.2 Regression Results

In order to test whether earnings management among manufacturing companies is significantly associated with conservatism policies, OLS regression analysis is performed. OLS regression assumptions are checked before performing the analysis in order to ensure that the assumptions are not violated. Table 5 presents the correlation matrix among the independent variables. The results document that there is no multicollinearity problem between independent variables, the highest correlation is between audit size and conservatism variables (r = .183). Furthermore, tests of normality, homoscedasticity, and linearity assumptions are checked to ensure that the assumptions are not violated.

Table 5. Correlation Matrix among Independent Variables

Variables	B/MV	TACC	SIZE	ROE	Leverage
TACC	-.060				
	.385				
SIZE	.121*	.008			
	.080	0.910			
ROE	-.175**	.034	.004		
	.011	.623	.958		
Leverage	-.118*	-.036	-.075	.011	
	.088	.604	.280	.868	
AUDIT SIZE	.183***	-.040	-.098	-.071	.058
	.008	.563	.154	.303	.401

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Table 6 presents the results of OLS-regression analysis. This model is highly significant (F = 6.055 P-Value = 0.000) with an adjusted R^2 9.8%, which means that the combinations of the Independent variables explain around10 % of variation of dependent variables. Specifically, earnings management is found to be related to conservatism, company's size and performance.

Table 6. The Result of Multiple Regression Analysis

Variables	Coefficients	t-statistic	P-Value	VIF
Intercept	0.306	5.872***	.000	
B/MV	-.025	-1.924*	.087	1.102
SIZE	-.017	-5.016***	.000	1.034
ROE	.000	-2.492**	.018	1.034
Leverage	-.019	-1.349	.181	1.024
Audit Size	-.014	-.618	.676	1.058
Adjusted R^2	0.098			
Model F Test	6.055 P-value = .000			

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Specifically, For *H*: Ceteris paribus, there is a negative relationship between the level of discretionary accruals and the extent of accounting conservatism. The results of multiple regression document negative relation between earnings management and conservatism. The results find support for *H* and for the previous studies such as (Wakil, 2011; Lubberink and Huijgen, 2000; Lafond and Watts, 2007), but inconsistent with Penman and Zhang (2002). For control variables, the results document that company's size is significantly and negatively related to earnings management. This result is consistent with (Kamarudin et al., 2003; Naveen et al., 2008). However, performance is found to be significantly and negatively related to earnings management inconsistent with (Bartov et al., 2000; Chen et al., 2006).

The results of sensitivity analysis presented in Table 7 presents that there is negative but insignificant relation between conservatism policies measured by total accrual to net income instead of book to market value and earnings management. Additionally, the results of control variables tend not to conflict with the conclusion provided by primary analysis of the study.

Table 7. The Result of Sensitivity Analysis

Variables	Coefficients	t-statistic	P-Value	VIF
Intercept	0.299	5.704***	0.000	
TACC	.000	-.027	.407	1.004
SIZE	-.018	-4.216***	.000	1.015
ROE	.000	2.202**	.029	1.006
Leverage	-.016	-1.174	.242	1.010
Audit Size	-.022	-.667	.506	1.014
Adjusted R^2	0.088			
Model F Test	5.718 P-value = .000			

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

5. Conclusion and Future Research

The objective of this study was to investigate the level of conservatism in accounting policies and to examine its effect on earnings management activities for companies listed on the Amman Stock Exchange (ASE) for the period 2006-2009. The results document that there is a significant variation among companies in applying alternative levels of conservatism policies. Furthermore, the results reveal that there is negative relation between earnings management and, conservatism, company's size and performance.

The current study contributes to the literature of earnings management and conservatism. It documents evidence that conservatism policies help to constraint earnings management. However, there are several areas that are not covered by the present study but could be relevant to conservatism and earning management. One possible avenue for future research is to investigate the relationship between corporate governance mechanisms and conservatism policies and its implications for earnings management.

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The Effect of Corporate Governance, Corporate Financing Decision and Ownership Structure on Firm Performance: A Panel Data Approach from Tehran Stock Exchange

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Abstract

Capital structure, dividend policy and corporate governance are today significantly influencing academic debates on firm's value, while they can increase profitability and shareholder's value in long term. This paper seeks to investigate the affects of corporate governance mechanisms and financing activities on firms' performance. A sample of 84 firms listed on Tehran Stock Exchange for a period of five years from 2007 to 2011 was selected. These firms were chosen by employing random classified sampling. The study used Return on Investment (ROI) and Tobin's Q as proxies for performance and developed multiple and single regression models, mean tests and correlation coefficients to test the hypotheses. The findings reveal that corporate governance, financing decisions and capital structures are affected by firms' performance.

Keywords: corporate governance, ownership structure, agency theory, financing decision, performance

1. Introduction

Capital market is an essential component of economics because it begins the stagnant funds and is also considered as a proxy for economic growth of countries. Therefore considering this market and the fundamental decision making basis are necessary. It is obvious that profit maximization is the main purpose of managers which generally aim at. Investors, internal employees and society at a large scale are the beneficiaries of successfulness in creating value of firms. Given that Performance evaluation in decision making is considered as a very significant subject in financial economics, it seems necessary for financial and economical measures to be evaluated.

The conflict of interest between owners and managers has caused performance evaluation of managers and firms to become an important aspect which is largely considered by different parties such as creditors, owners, government and even managers (Jensen & McLin, 1976).

Conflict of interest among stakeholders is one of the most important and influential factors because firms confront different decisions which include paying dividends or repaying debts and financing new investments. There is tight relationship among earnings per share, investments and finance, therefore, making suitable decisions and policies in accordance with economic situation, industry and a given firm leads to better performance and finally increased value of firms. Corporate governance and topics related to stakeholders (managers, employees, customers, executive managers, board of directors and shareholders) are imperative fields in developing countries like Iran. Financial performance of firms has a direct relationship with corporate governance. More qualified managers implement more effective corporate governance and pay more attention to their stakeholders which at last causes more return.

Managers are expected to be successful in dealing with growth, on time repaying of accruals, creating value for shareholders, managing risk, and developing corporations' purposes. When the performance of firms is affected by corporate governance structure, then shareholders need more controls to be performed on managers that aim to reduce the consequences of conflict of interest resulting from agency costs on the profitability of firms .The existing corporate governance system deals with several internal factors such as ownership structure of firms, economic situation, legal framework, public and cultural policies. Ownership structure and legal frameworks are the most important factors between all. Any change in components and ownership structure results in a change in governance path and their performance and at last leads to an increase or decrease in agency costs.

Investigating the quality and quantity of corporate governance and its affects on firms' performance can be useful to support investors and help financial analyzers since in recent years there are satisfactory changes happened in Iran in consistent with the privatization law enacted. This study has been designed and carried out to examine the affects of corporate governance and financing decisions on financial and economic performance of firms.

2. Literature Review

Ozer and Yamak (2004) tested whether the level of market control by shareholders in a diversified stock ownership lead to a difference in the firms' performance. Their findings demonstrated that the relationship between ownership structure and firm's performance is only significant for return on assets and return on equity; while return on sale and interest rate have no significant relationship with shareholders combination. Lefort (2007) documented that an increase in the ratio of the non executive members of board of directors results in increased firm value. When the ratio of non executive members and professional ones are analyzed separately then it is only the ratio of the non executive members that affects firm value.

Liu and Lu (2007) employed the percentage of shares in hand of senior executive managers, level of independence between board of directors, regulatory environment and institutional situation on corporate governance to measure the relationship between earnings management and corporate governance. Their results showed that the degree of earnings management is significantly related to measurement proxies of corporate governance. In a similar study Imam and Malek (2007) examined the relationship among ownership structure and firms' performance and dividend policy. Their research sample consisted of 201 firms for a three years period covering 2001-2003. Their results demonstrated that corporate ownership has a positive and significant effect on the firm's performance, while dividends policy is negatively affected by management ownership concentration. Emran (2008) argued that the ownership in developing countries belong with a small group of specific people, e.g., entities or government and this has provided a situation in which there is no major conflict between managers and stakeholders. In another study Siregar and Utama (2008) found evidence that institutional ownership, size of the firm and corporate governance approach do not influence on the type of earnings management. They had documented no evidence based on the effect of corporate governance variables (including auditing quality, directors' independence and auditing commission) on the type of earnings management.

Al Mutari (2009) examined 80 firms listed on Kuwait Stock Exchange in a 9 year period including 2000-2008. The results of their study showed that the type of shareholders influences on firms' value, while public and individual ownership have a negative and significant impact on the firms' value. In addition to capital structure, dividends policy is also another factor directly affecting firm's value, he declared. Al Najar (2009) investigated the relationship between ownership structure and corporate governance among non-financial firms in Jordan. They found that institutional investors care about diverse factors such as capital structure, trade risk, profitability, property structure, asset liquidity and size of the firm in their decisions around investments. Generally they prefer investments in service companies in comparison with manufacturing firms. He argues that there is no significant relationship evidenced between dividends policy and institutional investors. Guedhami, Pittman&Saffar (2009) examined the ownership structure in accordance with the selection of auditing firms after which they controlled the factors relating to size, financial leverage, and inventories to total assets, sales growth and gross domestic product. They showed that public and foreign ownership is negatively related to the selection of Big-4 companies. Block et al (2010) studied corporate governance and market value of firms in Korea for a period of 1998 to 2004 and they found that firms with better governance have less capital expenditure while sales growth is low and investment is more sensitive to profitability. The results also showed that profitability is sensitive to more growth opportunities. Lanor and Almarzoughi (2011) used 35 French-listed companies in 2002 to 2005 and examined their intuitional ownership and their performance. The results indicate that there is a significant reverse relationship between these two indices measured by Tobin's Q. Setayesh et al (2010) found that corporate governance affects on earnings smoothing. They included 383 firms listed on Tehran Stock Exchange for a period of years covering 2003-2009. Multi logistic regression was employed and it was found that different groups of corporate governance have no consistent affect on industrial groups while the independence of board of directors does not influence on earnings smoothing.

3. Statistical Population, Sample and Methodology

We have used all firms listed on Tehran Stock Exchange with the following characteristics for a period covering 2006-2010:

They shouldn't have been classified as financial intermediaries, banks, insurance companies and investment companies.

Their fiscal year should have been in consistent with the calendar year and there should be no change in their fiscal year for those years under investigation.

There should have been data related to institutional shareholders with more than 5% ownership in the given period.

Finally, there were 384 firms and 84 firms constituted our sample.

3.1 Methodology

The present paper is a descriptive study and uses mean comparison tests along with simple and multiple regression models in order to examine the relationship between variables.

3.2 Variable Calculations

Firms' performance is the dependent variable chosen to measure Return on Investments (ROI) and Tobin's Q as follows:

TOBIN 'S Q=MV/BV-DEBT

Where in it;

MV= Market Value of firms (number of shares multiplied by their price at the end of the period) and

BV= Book value of assets (Mahdavi & Heyderi, 2006)

In addition Return on Investments is calculated as follows:

ROI= Net Income/Average Investments

Independent variables of the study include corporate governance, financing decisions and ownership structure which are explained below.

Corporate governance mechanisms are measured by 4 components as follows:

1- Internal auditing is a dummy variable that is equal to 1 when there is an internal auditor and 0 otherwise.

2- Non executive members to total members of board of directors which is measured by dividing the mentioned items.

3-The ownership percentage of institutional investors that include the percentage of shares owned by insurance companies, investment corporate and banks as defined by Stock Exchange Committee.

4-CEO Duality is a dummy variable that takes the value of 1 if the CEO is also the chairman of the board of directors and 0 otherwise.

Financing decisions are also measured by capital structure and dividend policy. Capital structure is calculated by dividing total debts to total assets followed by dividend policy which is the result of dividing DPS (Dividends per Share) to the current price of each share. Ownership structure is another dummy variable which takes the value of 1 if there is an institutional investor and 0 otherwise.

3.3 Hypothesis Development

H1-Corporate governance influences on firm's performance.

H1-1- The ratio of non-executive members influences on firm's performance.

H1-2- The percentage of institutional investors influences on firm's performance.

H1-3- CEO Duality influences on firm's performance.

H2- Financing decisions influence on firm's performance

H2-1-Capital structure influences on firm's performance.

H2-2- Dividend policy influences on firm's performance.

H2-3-Ownership structure influences on firm's performance.

3.4 Data Analysis

3.4.1 Descriptive Statistics

Table1. Shows the Mean and Standard Deviation of variables described above.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Assets	269	18425000000	354528035000000	5694419399146	31164361550369
Liabilities	269	6362000000	331379476000000	4454616597225	28524671462208
Net income	269	347000000	13893793000000	394362329040	1466549418596
Market value	269	210	25995	4720	4577
Number of shares at the end of fiscal year	269	5000000	6300000000	333717629	871403764
Market Value at the end of fiscal year	269	25479700	41961600000000	1063043613536	3288987019751
DPS	231	0	5840	553	742
Institutional stockholders	241	.00	100.00	31.88	31.27
ROI	269	.00	.39	.12	.08
QTobin's	269	.34	3.39	1.32	.56
Capital Structure	269	.10	1.44	.64	.20
Dividends policy	231	.00	3.48	.18	.40
Valid N (listwise)	217				

Descriptions: Table 1 shows the Mean and Standard Deviation of variables described above.

We have initially calculated the Kendall's tau_b between performance evaluation measures (Tobin's Q and ROI) and independent variables mentioned. That is because variables are not normal. The results are indicated in table 2.

Table 2. Correlations

			Non-Executive directors	Percentage of institutional investors	Capital Structure	Dividend Policy	ROI	QTobin'S
Kendall's tau_b	ROA	Correlation Coefficient	-.126	.111	-.384	.119	1.000	.281
		Sig. (1-tailed)	.003 *	.006	.000	.004	.	.000
		N	237	241	269	231	269	269
	QTobin'S	Correlation Coefficient	-.164	.063	-.058	-.176	.281	1.000
		Sig. (1-tailed)	.000	.075 **	.078	.000	.000	.
		N	237	241	269	231	269	269

Descriptions: Table 2 shows the calculation of the Kendall's tau_b between performance evaluation measures and independent variables mentioned.

Table 2 shows that ROI has an inverse relationship with the ratio of non-executive members and capital structure, while it is directly related to the percentage of institutional investors and dividend policy. Tobin's Q is inversely related to the ratio of non-executive members and dividend policy. Simple linear regression has been employed to investigate the effect of variables on firm's performance and to find a model for the prediction of performance.

Table 3.

Independent Variable	R	R2adjusted	F	Sig F	β	t	Sig t
The ratio of non-executive members	0.178	0.028	7.722	0.006	-0.178	-2.779	0.006
The percentage of institutional investors	0.173	0.026	7.341	0.007	0.173	2.079	0.007
Capital Structure	0.502	0.249	89.967	0.000	-0.502	-9.485	0.000
Dividend Policy	0.094	0.005	2.06	0.153	0.094	1.435	0.153

Descriptions: Simple regression model in order to examine the relationship between independent variables with ROI

Table 3 (simple regression of ROI) shows that all examined variables except dividends policy influence on firms' performance. The most significant inverse effect is related to capital structure and the percentage of non-executive members is also negatively related to performance. The percentage of institutional investors' ownership has a direct relationship with Return on Investment.

Table 4.

Independent Variable	R	R2adjusted	F	Sig F	β	T	Sig t
The ratio of non-executive members	0.241	0.054	14.492	0.000	0.241	3.807	0.000
The percentage of institutional investors	0.092	0.004	2.035	0.155	-0.092	-1.427	0.155
Capital Structure	0.073	0.002	1.433	0.232	-0.073	-1.197	0.232
Dividend Policy	0.247	0.057	14.86	0.000	0.247	3.855	0.000

Descriptions: Simple regression model in order to examine the relationship between independent variables with Tobin's Q.

According to the table above, the ratio of non-executive members and dividend policy influence on firms' performance. It means that the firms' performance enhances with an increase in these variables. Multiple regressions are also employed to investigate the simultaneous effect of considered variables on firms' performance. Table 5 uses Stepwise method as the optimum solution.

Table 5. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.671	.023		29.226	.000
	Capital structure	-.333	.034	-.557	-9.690	.000
2	(Constant)	.708	.026		27.707	.000
	Capital structure	-.326	.034	-.545	-9.660	.000
	Non-executive managers	-.001	.000	-.173	-3.056	.003
3	(Constant)	.707	.025		28.166	.000
	Capital structure	-.334	.033	-.560	-10.058	.000
	Non-executive managers	-.001	.000	-.182	-3.276	.001
	Dividend policy	.048	.016	.165	2.968	.003

Descriptions: Multivariate regression model in order to examine the relationship between independent variables with ROI is used.

As you can see, the most significant independent variables are capital structure followed by the ratio of non-executive members and dividend policy. The ratio of institutional investors does not influence on firms' performance.

Table 6. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.829	.026		32.311	.000
	Dividend policy	.209	.056	.250	3.739	.000
2	(Constant)	.680	.051		13.305	.000
	Dividend policy	.198	.055	.237	3.614	.000
	Non-executive managers	.003	.001	.219	3.345	.001

Descriptions: Multivariate regression model in order to examine the relationship between independent variables with Tobin's Q is used.

The table above indicates that the most effective variables are dividend policy and the ratio of nonexecutive members, respectively. Firms' performance is not affected by other variables included. Finally, mean comparison test for two independent samples has been employed for investigating the effect of dummy variables such as the existence of institutional investors and CEO duality. The final results are reported in table 7.

Table 7.

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
ROA	Equal variances assumed	4.264	.040	-2.327	245	.021
	Equal variances not assumed			-2.453	73.846	.017
QTobin'S	Equal variances assumed	19.314	.000	-2.637	245	.009
	Equal variances not assumed			-4.042	158.836	.000

Descriptions: Mean comparison test for two independent samples for investigating the effect of dummy variables and CEO duality

According to the table above, those companies that have institutional investors are better performers than others (considering both ROI and Tobin's Q).

Table 8.

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig (2-tailed)
ROA	Equal variances assumed	4.264	.040	-2.327	245	.021
	Equal variances not assumed			-2.453	73.846	.017
QTobin'S	Equal variances assumed	19.314	.000	-2.637	245	.009
	Equal variances not assumed			-4.042	158.836	.000

Descriptions: Mean comparison test for two independent samples for investigating CEO duality

The results reveal that these variables have no impacts on firms' performance (considering both ROI and Tobin's Q)

4. Discussion

The results of testing the research hypothesis are summarized as follows:

Table 9.

Hypothesis	Variable included	The effect on ROI	The effect on Tobin's Q	Result
	The ratio of non-executive members	inverse	inverse	Accepted
	Ownership percentage of institutional investors	Direct	direct	Accepted
	CEO Duality	Not significant	Not significant	rejected
	Capital Structure	inverse	inverse	Accepted
	Dividend Policy	direct	inverse	Accepted
	The ownership of institutional investors	direct	direct	Accepted

Descriptions: The results of testing the research hypothesis.

There is an inverse relationship between the ratios of non-executive members in a board of directors and firms' performance measures which is not in consistent with the previous findings. This might be because of the weak performance of non-executive members. This is not also in consistent with the findings of Lifert.

There are some researches about corporate governance which do not verify the direct relation between the percentage of institutional investors and firms' performance measures and this is in consistent with Emam and Malek. Lanour and Al marzoughi came into a different conclusion and found that both proxies for financing decisions are related to performance measures. Capital structure measured by financial leverage has an inverse relation with the both performance measures and this shows that increased debt in capital structure leads to decreased performance. This relationship can be a reason for managements' weakness in optimum use of financial leverage and selecting a capital structure which is not suitable. Dividend policy is in direct relation with ROI while it does not hold true for the relationship with Tobin's Q. Tobin's Q can be considered as a proxy for growth opportunity and that's why decreased growth opportunities firms decide to divide more income. Capital structure variable measured by the existence of institutional investors has a direct relationship with firms' performance and this reflects the fair role of institutional investors. It should be noted that the findings about capital structure, dividend policy and the type of stockholders are in consistent with El-Mutari study.

5. Suggestions

Stockholders of a company that select the board of directors' members are suggested to select the managers more accurately. Non-executive members are also offered to do their operations better and more effectively.

According to the inverse relationship between capital structure and firms' performance, managers should struggle to consider the optimum use of financial leverage and capital structure. This is the case which is also mentioned for stockholders and other decision makers in performance measurement.

The findings reveal that there is a direct positive relationship between institutional investors and firms' performance. Hence this is suggested to investors to comprehend the mentioned items in their decision makings.

6. Future Researches

Future studies can be in different fields including investigating the effect of asymmetric environment on the selection of corporate governance mechanisms or investigating the relationship between conservatism and the type of ownership in institutional investors.

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Islamic Development Bank, Foreign Aid and Economic Growth in Africa: A Simultaneous Equations Model Approach

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Abstract

This study is an empirical investigation on the role of the Islamic Development Bank (IDB) Group through its foreign aid activities in contributing to the economic growth of African countries, especially the African Muslim Countries (AMCs). The AMCs, which is serving as the sample countries for this study constitute more than two-third of the IDB member countries from Africa. Therefore, this study provides empirical evidences from AMCs like Algeria, Burkina Faso, Egypt, Senegal, Niger, Morocco and Tunisia among others, on the impact of its development assistance (DA) on the economic growth of these countries using balanced panel data of six years average from 1987-2010. In order to accomplish the objectives of this paper, Simultaneous Equations Model (SEM) was adopted and Seemingly Unrelated Regressions Estimate (SURE) method was utilized for its estimation. In view of this, the findings from this study revealed that the DA of IDB has positive impact on the economic growth of AMCs through investment as the major transmission mechanism. Moreover, the impacts of the DA on human capital were more than that of investment and growth. This paper hereby recommends that the IDB should give more attention to these important transmission mechanisms, since they are among the expected gains of foreign aid to LDCs as theoretically advanced in the literature and empirically established. Evidently, this study is perhaps the first of its kind to empirically investigate the impact of the foreign aid activities of IDB in Africa, especially in AMCs.

Keywords: foreign aid, AMCs, IDB, economic growth, SEM, Africa, SURE method

JEL Code: H27, H30, F35, F43, N17

1. Introduction

The Islamic Development Bank is a multilateral development bank (MDB) and the largest trade and financing institution in the Muslim world. It was established in pursuance of the Declaration of Intent issued by the first Conference of Finance Ministers of Muslim Countries held in Jeddah (1973). However, the formal establishment and commencement of activities of the Bank was in 1975. Against this background, the purpose of the Bank is to foster the economic development and social progress of member countries and Muslim communities individually as well as collectively in accordance with the principles of Shari'ah i.e. Islamic Law. It engages in a wide range of specialized and integrated activities, which include: resource mobilization, investment, public and private sector financing, trade financing, technical assistance for capacity building, technical cooperation among member countries, debt relief, emergency relief and a host of others (IDB, 2009, 2011a). The Bank is made up of 56 member countries with spread across four continents i.e. Africa, Asia, Europe and Latin America. The member countries have approximately 1.55 billion people as at 2010, which represents over one-fifth of the world's population. All the member countries are part and parcel of Organization of the Islamic Conference, which is the umbrella body and the Bank serves as its financial wing as noted by (Pramanik, 2003). The main shareholders of the Bank are presented in the Table 1.

Table 1. The Major Shareholders of IDB

S/N	COUNTRY	CONTINENT	SHARES (%)
1.	Saudi Arabia	Asia	23.6
2.	Libya	Africa	9.47
3.	Iran	Asia	8.28
4.	Nigeria	Africa	7.69
5.	Qatar	Asia	7.21
6.	Egypt	Africa	7.10
7.	Turkey	Europe	6.48
8.	U.A.E.	Asia	5.81
9.	Kuwait	Asia	4.48
10.	Other Member Countries	Various Continents	16.87

Source: Adapted from IDB (2011a).

Importantly, the Bank in almost four decades of its inception and operations has been contributing immensely to the socio-economic advancement of its member countries and the world at large through its numerous activities and indeed, Africa has been one of the major beneficiaries. Africa alone has 27 countries as members of the Bank and thus, in the Bank classification of Least Developed Member Countries (LDMCs) of 28 countries, 18 of these countries are African (IDB, 2008a). By virtue of being members of this special group, they enjoy a lot of privileges in terms of allocations and projects execution of the Bank, which aimed at poverty alleviation, boosting economic growth and enhancing institutional capacity so as to manage and sustain development projects and programs. More so, most of the activities in the LDMCs are concentrated in education, health, agriculture and water supply sectors (IDB, 2004). Notwithstanding these developmental efforts and initiatives, the African continent contains the largest number of backward and least developed countries, while almost half of its population lives in poverty. Africa comprises 32 of the world's 48 least developed countries and 34 of the 45 lowest-ranked countries for human development in UNDP Human Development Report of 1998 and the HDI for Sub-Saharan Africa (SSA) in 2001 was 0.47. In the same vein, the 2007/2008 Human Development Report also revealed that 22 countries suffer from low human development and that 11 African member countries of IDB are affected (Dowden, 2011; Easterly & Levine, 1997; Gyimah-Brempong & Wilson, 2005; IDB, 2007; Kasekende, 2008). Similarly, the HDI of 2010 by the UNDP listed 42 countries with HDI of 0.8 and above. Unfortunately, there is no African country that fall within the highest level except in the category of low human development with Zimbabwe at the bottom of the ladder. The continent also suffers high level of growth deficits over the last four decades (Agubuzu, 2004; Gambari, 2004; UNDP, 2010). It needs to be stressed also that on current trends, growth is still inadequate in most African countries, particularly with respect to achieving the Millennium Development Goals (MDGs). In view of the foregoing submissions, it should be made clear that among the theoretical expectations and assumptions on foreign aid, which is also known as development assistance (DA) in the IDB parlance is that it should serve as a potent fiscal tool to stimulate and enhance the economic growth of developing countries and more especially LDCs like African countries. Hence, foreign aid is considered to be necessary and beneficial to the economies of LDCs, especially in the areas of promoting growth, poverty-reduction, increasing investment, human capital development, supporting good governance and a host of others. More particularly, it has been noted by Adeoye (2006) as well as Loxley and Sackey (2008) that among the most important factors and ingredients required to propel Africa's growth process are investment in physical and human capital. Hence, for meaningful and purposeful growth and sustainability in the continent, substantial investment are necessary in these important determinants of growth. In view of this, multilateral development and financial institutions like the Islamic Development Bank (IDB) Group has long been involved in the promotion and fostering of the economies of LDCs and developing countries in various continents like Africa, Asia and Latin America among others. In view of the fact that 2015 draws closer, implementation of policies to meet the Millennium Development Goals (MDGs) in Africa, especially for SSA is now more urgent and important than ever. This scenario of revenue bottlenecks in the continent underscores the seriousness of financial resource gap, which foreign aid is expected to fill, especially as the continent battles with the great desire and desperation to realize MDGs by 2015 and IDB Vision 1440H. Hence, there is the urgent need to mobilize domestic and external resources to achieve these noble initiatives and programs have become more imperative. As a matter of fact, for Africa to achieve sustainable development in the real sense, collaboration with various global financial institutions, organizations and agencies are necessary, especially the ones that are genuinely interested in the development of the continent like the IDB has become more imperative. Basically, the IDB since 1976 to 2010 has cumulatively expended over US$70.321 billion (i.e. net approval) as the DA to both member and non-member

countries in various parts of the world. However, according to IDB (2011b), the Bank's activities are dominated by trade financing which accounts for 52.5 percent of total financing, followed by project financing, which was 46 percent, special assistance was 1percent and technical assistance was 0.5 percent. All these mode of financing represent the four major classification of DA in IDB.

However, despite the fact that the IDB is the most leading and prominent Islamic multilateral financial institution and aid agency in the Muslim world and especially with its almost four decades of foreign aid activities; it is surprising to note that no empirical study is available on the impact of its foreign aid activities on the economies of African countries, particularly the African Muslim Countries (AMCs). Hence, our empirical investigation examined the impacts of the DA of IDB on the economic growth, investment drive and human capital development (HCD) of selected African countries, which we refer to as "African Muslim Countries-AMCs". The AMCs constitute more than two-third of the member countries of IDB from Africa. In view of this, the study utilized the panel data approach of 6years average with SEM adopted as the base model with SURE method used as the estimating technique as against the OLS procedure, which often exhibits simultaneous bias in the face of simultaneity. This adoption is in line with the position of Zellner and Theil (1962), Zellner (2006) and Arazmuradov (2011) in their studies. In fact, Zellner (2006) posits that SURE method guarantees improved hypothesis tests regarding regression coefficients and the values of other parameters in the SEM equations are better estimated. To this end, the entire paper is divided into five sections with this introduction serving as section one. Issues on the conceptual and theoretical framework as well as the DA of IDB in Africa form the contents of section two. Section three presents the research methodology and data analysis; while empirical findings are presented in section four. The conclusion and recommendations of this study are presented in section five.

2. Conceptual and Theoretical Framework

2.1 Conceptual Framework

2.1.1 Foreign Aid

It involves transfer of resources or wealth from the developed countries or multilateral development institutions like World Bank, IMF, OECD, AsDB, AfDB, IDB and a host of others to LDCs or developing countries for the purpose of promoting economic development. Foreign aid is also referred to as foreign assistance, development assistance/aid or external aid from various International Financial Institutions and Agencies like DFID, CIDA and USAID among others. Easterly (2003) submits that the standard definition of foreign aid according to the Development Assistance Committee (DAC) implies grants and concessional loans net of repayment of previous aid loans. This is a measure that treats forgiveness of past loans as current aid and this may be regarded as a reasonable measure of the actual transfer to liquidity-constrained governments. Thus, the foreign aid emanating from OECD is referred to as ODA (i.e. Official Development Assistance) and it has always been the major reference point when discussing about foreign aid (Riddell, 2007; IDB, 2008b). Therefore, foreign aid in simple terms means the transfer of resources/wealth from developed nations or international financial institutions or agencies to less developed countries, which could either be through bilateral or multilateral means for the purpose of promoting economic growth and development in LDCs. This transfer may be in the form of grants that do not need to be repaid or loans that carry lower rates of interest or no interest as it is obtainable in IDB and also, longer period of repayment than normally would be allowed. Nevertheless, Arnold (1985) and Shah et al. (2005) identified various types of foreign aid to include: financial aid which could be either tied or untied (such as loans and grants), commodity aid, technical aid, foreign direct investment (FDI), bilateral aid, multilateral aid, emergency assistance, project aid, program aid and military aid. Foreign aid may also come in a variety of physical forms such as technical assistance, programs, projects such as infrastructural development and supplies of food or food aid (Moreira, 2003; Riddell, 2007). Other forms include debt forgiveness, sector assistance and investment. Against this backdrop, this study was largely concerned about those types and forms of foreign aid (known as development assistance – DA in the parlance of IDB), since the focus of this study is about the impact of the foreign aid activities of IDB on AMCs. Therefore, the four major categorization of DA by the IDB are: i. Project financing; ii. Trade financing; iii. Technical assistance; and iv. Special assistance (IDB, 2008c, 2011b). It is based on this categorization that our data on foreign aid from the IDB were gathered and analyzed.

2.1.2 African Muslim Countries (AMCs)

Africa is a complex and heterogeneous continent that is made up of ethno- linguistic and religious diversities. For instance, Nigeria which is often described as "the Giant of Africa" has more than two hundred and fifty (250) ethnic groups speaking over four hundred (400) languages and dialects. The ethnic groups have diverse cultural and religious backgrounds but the two most dominant religions are Islam and Christianity (Central Intelligence Agency - CIA, 2011). Other types of religions include: traditional worshippers and free thinkers (secularists). This picture is

perhaps true for most African countries, especially in the SSA region. Essentially therefore, the concept of African Muslim Countries (AMCs) is a new concept introduced by this study to mean countries in Africa whose Muslim population is at least 50 percent (see Table 2), since there are other religious groups in the countries. However, the fact that an African country is a member of OIC or its head of government is a Muslim does not automatically qualifies such a country to be regarded as a Muslim country, rather the yardstick or criterion used in this research is the population parameter. The submission of USAID (2004) corroborates this position of what connotes a Muslim country: "The Muslim world is extensive and diverse, comprising 48 countries where at least 50 percent of the population is Muslim. It extends from West Africa (Morocco and Mauritania) to East Asia (Indonesia)". The table below provides more information on some selected basic indicators of AMCs.

Table 2. Basic Indicators for AMCs (2010)

Country	Population (000s)	Land area (000s of km2)	Pop. Density (pop/km2)	GDP (PPP, USD million)	GDP per Capita (PPP, USD)	Annual real GDP growth (average over 2002-10)	Muslim Pop. (%)
Algeria	35,423	2,382	15	234,572	6,622	3.9	99
Burkina Faso	16,287	274	59	20,986	1,289	5.5	60.5
Chad	11,506	1,284	9	17,469	1,518	8.4	53.1
Comoros	691	2	309	845	1,223	1.8	98
Djibouti	879	23	38	2,131	2,424	4.1	94
Egypt	84,474	1,001	84	501,752	5,940	5.1	90
Gambia	1,751	11	155	3,525	2,031	5.2	90
Guinea	10,324	246	42	11,672	1,131	2.5	85
Libya	6,546	1,760	4	93,233	14,244	5.2	97
Mali	13,323	1,240	11	15,243	1,144	4.9	90
Mauritania	3,366	1,026	3	8,250	2,451	4.1	100
Morocco	32,381	711	46	156,306	4,827	4.6	99
Niger	15,891	1,267	13	10,979	691	4.7	80
Nigeria	158,259	924	171	384,084	2,427	9.1	50
Senegal	12,861	197	65	22,009	1,711	3.9	94
Sierra Leone	5,836	72	81	5,128	879	8.7	60
Somalia	9,359	638	15	N/A	N/A	N/A	100
Sudan	43,192	2,506	17	92,741	2,147	6.9	70
Tunisia	10,374	164	63	100,606	9,698	4.5	98

Source: OECD (2011) and CIA (2011).

Note: N/A means data is not available.

Considering the fact that out of the 27 African countries that are members of IDB, 19 of them qualify as African Muslim Countries based on the population parameter of 50 percent earlier stated above. Therefore, there is the need for new vistas to be explored and new perspectives introduced in the ongoing economic and political debate of a richly endowed continent but caught in a "series of interlocking development traps" as posited by Collier (2006, p. 189). As a matter of fact, the concept of AMCs is a new economic and political concept introduced by this study as a contribution to the debate on the African growth and development process.

2.1.3 Theoretical Framework

Among the most popular and often quoted theories in the Aid-Growth nexus literature is the Financial Two-Gap model also known as the Double Deficits Model (DDM). The model was propounded by Chenery and Strout (1966). The model is based on the notion that economic performance and economic growth is stimulated and enhanced by foreign aid (Easterly, 2003; Ali & Isse, 2005). Basically, the model assumed that a gap exists either between savings and investment or between export and import, which LDCs could not overcome these gaps on their own due to their limited resources or shortage of investment and foreign exchange requirements, which are considered as two growth deficits. The rationale of the model therefore, is that foreign aid should make up the differences between either the export-import gap (M-E) or the saving-investment gap (I-S). According to Easterly (2003), the model predicted a strong growth effect for foreign aid through its role in promoting and boosting domestic investment beyond what domestic savings can achieve. As a matter of fact, this model has continued to be one of the most prominent and

relevant models and theories being used and often quoted in aid-growth nexus discourse (Easterly, 2003). However, Easterly (1999, 2003) criticized the model on the basis of its two basic assumptions. He argued that a linear relationship existing between investment and growth over the short and medium run is doubtful on the theoretical grounds. Furthermore, the second assumption that aid fills a financing gap and allows for greater investment will only hold if investment is liquidity-constrained. As such, if incentives to invest are unfavorable, aid will actually finance consumption, especially if the reason for low investment is due to poverty. Essentially, another model which is also dominating the literature is the Solow Growth Model, which is a standard neoclassical model of economic growth propounded by Robert Solow in his classic 1956 article. The model posits that economic growth is an outcome of capital accumulation, which is basically one of the objectives of foreign aid in LDCs. It assumed that countries that experience per capita growth have increasing capital-labor ratios, which in turn leads to high return rate of savings to compensate for the cost of capital depreciation and population growth. Therefore, the model is based on three basic sources or determinants of growth (GDP) i.e. labor (L), capital (K) and knowledge or technological progress (A) (Solow, 1956). He proposed that the study of economic growth should be based on a standard neoclassical production function (Mankiw, Romer & Weil, 1992). However, in view of the fact that this study aims at investigating the impact of foreign aid on economic growth with special attention given to the investment (physical capital) and human capital determinants of growth, we hereby adopted the Augmented Solow Growth Model proposed by Mankiw et al. (1992). They posit: "an augmented Solow model that includes accumulation of human as well as physical capital provides an excellent description of the cross-country data" (p.407). In the same vein, recent study by Cheng and Zhang (2008) also revealed that the driving force behind economic development is human capital, which is stimulated by foreign aid. In view of the fact that an Augmented Solow Model allows for the incorporation of the human capital variable, which is not possible in the Financial Two Gap Model, this study therefore adopted the model. Also, this study is based on the underpinning theoretical proposition of Bjerg, Bjornskov and Holm (2011), which states that the impact of foreign aid on growth is an indirect relationship with investment and human capital variables as transmission mechanisms. Loxley and Sackey (2008) did not mince words when they submit: "It is common to think of aid's impact on growth to be an indirect one with aid exerting a positive impact on some key variables in the growth process. One of such variables is investment" (p. 12). Against this background, we hereby present the theoretical framework for this study in the following diagrammatical format:

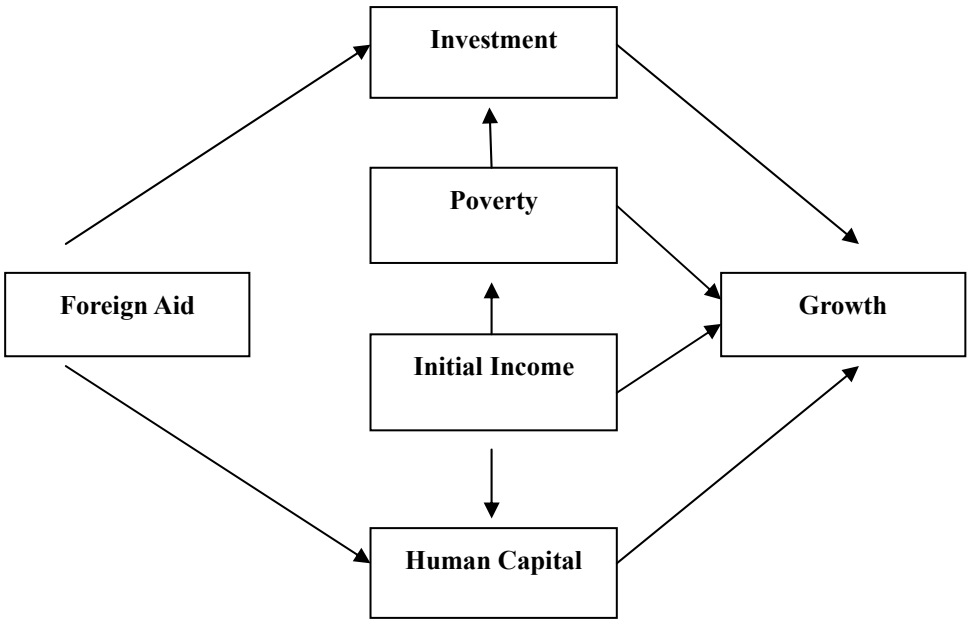

Figure 1. The Theoretical Framework for this study.

Source: Adapted from Bjerg, Bjornskov and Holm (2011).

2.2 IDB and Foreign Aid Activities in Africa: An Overview

The IDB initiated numerous development policies and programs in recognition of the socio-economic challenges facing member countries in sub-Saharan Africa. One of such policies and initiatives has been tagged as "Special Program for the Development of Africa (SPDA)" and five critical sectors have been identified for its operational activities: i. productivity growth in agriculture to achieve food security; ii. education projects to generate skilled workforce; iii. health projects focusing on the fight against major communicable diseases; iv. water and sanitation projects to improve quality of life; and v. power generation and distribution projects (IDB, 2008b). The focus of SPDA is expected to support investments in social and infrastructural areas, which are meant to fast track development in Sub-Saharan Africa. Similarly, the Bank allocated $2 billion within five years for supporting development efforts in 27 African member countries. Also, the Bank joined the Global anti-poverty efforts and allocated an ambitious $10 billion to fight this devastating phenomenon in member countries. This effort was tagged "the IDB Anti- Poverty Initiative" and it will among other things address the "root cause of terrorism" by fighting poverty, illiteracy and unemployment, which hopefully will reduce social tensions and foster better relations among nations. The Bank is also in its fifth year of a $2 billion African program, which included $50 million for the reduction of prices for anti-malaria medicines. The Bank has equally accepted the recommendations made at its annual symposium on "Capacity Building for Promoting Trade and Investment in Africa", as noted in IDB (2008a, p. 85): i. Enhancing its assistance for capacity building and developing innovative instruments and programs for technical assistance, taking into account the needs of African countries, particularly those related to supply-side; ii. helping African countries in involving their nationals living abroad in their capacity building activities and programs for promoting trade and investment; iii. assisting African member countries to acquire adequate skills in structured finance for trade and investment; and iv. enhancing its collaboration with regional and international institutions active in providing technical assistance to African countries in the areas of trade and investment. The IDB also launched a new 5-year Special Program for the Development of Africa (SPDA), which covers the period 2008-2012 and the sum of US$4 billion has been allocated to be spent. All in all, the table below presents an overview of the DA of IDB in Africa from 1976-2010.

Table 3. Cumulative Development Assistance of IDB to Member Countries in Africa from 1976-2010 (values in US$ million)

Country	Project Financing	Technical Assistance	Trade Financing	Special Asst.	Grand Total
Algeria	591.7	4.0	1887.7	5.6	2489.1
Benin	227.3	7.1	35.0	1.4	270.8
Burkina Faso	347.0	12.6	206.1	8.8	574.5
Cameroon	185.4	3.6	17.0	1.7	283.4
Chad	312.3	6.3	3.2	10.8	332.5
Comoros	11.1	4.9	7.5	1.1	24.5
Cote d'Ivoire	279.8	0.4	76.3	1.2	357.7
Djibouti	242.9	3.7	12.0	2.3	260.9
Egypt	907.8	3.9	2323.4	1.5	3236.7
Gabon	409.5	2.2	0.0	0.0	411.8
Gambia	165.2	4.5	103.0	1.8	274.6
Guinea	327.9	10.7	48.8	7.8	395.2
Guinea Bissau	2.2	3.8	15.0	1.2	22.3
Libya	386.0	3.3	299.8	3.8	692.8
Mali	446.5	12.0	199.8	16.5	674.9
Mauritania	523.4	23.0	84.5	11.1	642.0
Morocco	1619.7	5.5	2389.3	1.5	4016.0
Mozambique	126.6	2.3	15.0	2.2	146.1
Niger	271.6	14.5	138.3	12.2	436.6
Nigeria	90.5	0.3	205.0	7.9	303.7
Senegal	588.7	11.3	272.6	14.2	886.8
Sierra Leone	121.8	7.1	5.0	3.6	137.5
Somalia	24.1	4.0	46.2	13.3	87.6
Sudan	1065.8	5.4	372.4	23.5	1467.0
Togo	113.2	2.2	6.0	1.7	123.1
Tunisia	757.2	2.5	1094.9	4.2	2208.6
Uganda	69.9	4.4	13.9	4.5	92.6
Net Approval	**10,515.**	**165**	**10,003.7**	**165.5**	**20,849.3**

Source: Extracted from IDB Annual Report 2010.

From Table 3 above, it is glaring that member countries of IDB from Africa have benefitted from its development assistance over the years of its operations, especially the AMCs. For instance, among the topmost beneficiaries according to the highest allocation are Morocco ($4016.0m), Egypt ($3236.7m), Algeria ($2489.1m), Tunisia ($2208.6m) and Sudan ($1467.0m) among others. Notwithstanding this financial support from the IDB, more financial commitments are even most needed now that Africa is faced with many developmental challenges, particularly the twin-challenges of the MDGs and IDB 1440H Vision, which are all meant to fast track the development process of the continent. However, it is important to state that the AMCs received the total sum of US$19.142 billion from IDB as development assistance since 1976 through 2010. This amount represents 27.2 percent of the total sum of the DA by IDB to all member countries and non-member countries.

3. Research Methodology

It needs to be stated that most studies on foreign aid and economic growth focus on LDCs and developing countries, which are largely from Africa, Asia and Latin America continents. It was however observed that previous studies classified Africa into two broad regions i.e. Sub-Saharan Africa (SSA) and North/Tropical Africa (see Collier & Gunning, 1999; Loxley & Sackey, 2008). This research therefore combined Muslim countries from these two broad regions. This is in view of the fact that no specific empirical study is available on these Muslim countries, most especially as it relates to foreign aid and economic growth in the continent. More so, these sample countries (i.e. 19) are all members of IDB whose database on foreign aid in Africa was used for this study. As a matter of fact, the choice of this sample size was based on four reasons: i. the sample countries meet the population parameter of 50 percent, which is also in line with USAID (2004) submission on what constitute a Muslim country; ii. these countries are more than two-third of the entire member countries of IDB from Africa; iii. majority of the African

countries are the most backward and least developed countries in the world, especially the Muslim countries as posited by Aznan (2008) and IDB (2006); and iv. these countries because they are Africans, share similar demographic and economic characteristics to some extent as noted by Collier and Gunning (1999). It is however important to state that due to data paucity for some variables and countries, we therefore reduced the sample size to 14 countries and the following countries served as the sample countries: Algeria, Burkina Faso, Chad, Comoros, Egypt, Gambia, Guinea, Mali, Mauritania, Morocco, Niger, Senegal, Sierra Leone and Tunisia. Hence, the sample countries provide an excellent opportunity to investigate the impact of the DA of IDB in accounting for growth in these selected African countries.

3.1 Hypotheses and Model Specification

In view of the foregoing presentation and discourse about foreign aid and IDB's role in the African continent, we therefore identified that among the leading challenges confronting the AMCs in particular and Africa in general are related to growth, investment and human capital development among others. Against this background, we therefore seek to investigate what impact does DA of IDB has on the growth of AMCs, its contribution to the investment drive in these countries and the impact of the DA on human capital in the sample countries. Hence, we adopted the following hypotheses:

H1: The DA of IDB contributes positively to the economic growth of AMCs.

H2: The investment drive of AMCs is positively affected by the DA of IDB.

H3: The DA of IDB impact positively on the human capital development of AMCs.

Moreover, in order to achieve the set objectives for this study, Simultaneous Equations Model (SEM) using proxy variables was adopted as the base model for this study and Seemingly Unrelated Regressions Estimate (SURE) method was utilized for the estimation of the model based on balanced panel data of 6years average. The use of SEM is in line with the submissions and adoptions by Gyimah-Brempong (1992), Abiola (2003) and Sullivan, Tessman and Li (2011), who noted that the best approach for understanding the interdependencies that exist among variables, which give feedback loops, is to use SEM. This is because single equation overlooks these interdependencies. Thus, in the SEM specification therefore, investment and human capital are regarded as proxy variables through which the impacts of the development assistance of IDB were measured. In the same vein, the use of SURE method for the estimation of SEM was applied by Zellner and Theil (1962), Zellner (2006) and Arazmuradov (2011). In fact, Zellner (2006) noted that SURE techniques guaranteed improved tests of hypothesis regarding regression coefficients and the values of other parameters in the SEM framework. Against this backdrop, the SEM framework for this study is based on the Augmented Solow growth model propounded by Mankiw et al. (1992). In view of this, the SEM framework is hereby specified below:

$$G_i = \beta_1 + \beta_2 \ln S_{ki} + \beta_3 \ln S_{hi} + \beta_4 \ln y_{0i} + \beta_5 \ln POV_i + \varepsilon_i \quad (1)$$

$$\ln S_{Ki} = \alpha_1 + \alpha_2 \ln AID_i + \alpha_3 \ln S_{hi} + \alpha_4 G_i + \alpha_5 \ln POV_i + u_i \quad (2)$$

$$\ln S_{hi} = \gamma_1 + \gamma_2 \ln AID_i + \gamma_3 \ln S_{ki} + \gamma_4 G_i + \gamma_5 \ln EDU_i + v_i. \quad (3)$$

Where G, ln S_k and ln S_h are endogenous variables while ln y_0, ln *POV*, ln *AID* and ln *EDU* are exogenous variables; and ε, u, and v are the stochastic error terms. Therefore, equation 1 was used to estimate for hypotheses 1 while equations 2 and 3 were used to estimate for hypotheses 2 and 3 respectively. It is important to state that our model satisfied the requirements for identification based on Order condition (i.e. Justly identified) and the Rank condition based on equation 1 at $\gamma_{21}\gamma_{34} \neq 0$; equation 2 at $\gamma_{12}\gamma_{34} \neq 0$; and equation 3 at $\gamma_{12}\gamma_{23} \neq 0$.

3.2 Definition of Variables and Sources of Data

There are basically three endogenous and four exogenous variables in the SEM framework adopted in this study. The endogenous variables are: G means the economic growth which is proxy by GDP per capita growth; S_k implies investment (physical capital) with proxy as gross fixed capital formation and S_h means human capital and its proxy is infant mortality. All other variables are regarded as exogenous variables and they include: y_o i.e. initial income proxy by GDP per capita of every panel period; AID represents aid from IDB proxy by the four major categories of DA; POV stands for poverty proxy by GDP per capita; and EDU means education proxy by primary school enrolment rate. The table below provides summary information for all the variables including their sources of data.

Table 4. Definition of Variables and Sources of Data

S/N	Variable	Indicator	Source
1.	Growth	GDP per capita growth (annual %)	World Bank & IMF
2.	Investment	Gross fixed capital formation (% of GDP)	World Bank & IMF
3.	Human Capital	Mortality rate, infant (per 1000 live births)	World Bank & IMF
4.	Initial Income	GDP per capita (First year of every average period)	World Bank & IMF
5.	EDU	Primary school enrolment, (% gross)	World Bank & IMF
6.	AID	The four major categorization of DA in IDB	IDB
7.	POV	GDP per capita	World Bank & IMF

4. Data Analysis and Empirical Findings

4.1 Spearman Rank-Order and Correlation Analysis

Among the most interesting aspects of diagnostic test, especially with the spearman rank correlation is the easiness it provides in the identification of the strength and direction for each pair-wise relationship (i.e. whether the correlation is negative or positive). The correlation result which is provided in Table 6 below shows that among all the major variables, AID demonstrates high level of correlation with economic growth at around 20 percent. Investment also shows correlation of 12 percent while human capital with its negative sign shows no correlation. The human capital variable shows the highest level of correlation with AID at more than 53 percent while investment shows almost 49 percent correlations and there is also correlation between investment and human capital. Against this background, we therefore submit that there is correlation between growth and AID as well as investment. To this end, we conclude by rejecting the null hypothesis of no correlation among variables. This finding concurs with similar finding by Arellano et al. (2009).

Table 5. Spearman rank-order and correlation analysis (1987-2010)

Correlation	Growth	AID	Investment	Human Capital
Growth	1.000			
	____			
AID	0.196***	1.000		
	(0.000)	_____		
Investment	0.125**	0.489***	1.000	
	(0.022)	(0.000)	_____	
Human Capital	-0.019	-0.535***	-0.509***	1.000
	(0.729)	(0.000)	(0.000)	_____

*The null hypothesis is no correlation among the variables. With the exception of growth, all other variables are in natural logarithm. The probability values are reported in parentheses. Note that ***, ** and * indicate that the coefficient is significant at 1%, 5% and 10% levels respectively.

4.2 Empirical Findings and Discussions

4.2.1 Growth as the Dependent Variable

Table 6 below shows the result for growth as the dependent variable and four other variables as the regressors or explanatory variables. The choice of these variables for inclusion as determinants of growth is based on theoretical and empirical evidences. For instance, investment (representing physical capital) is regarded as a major determinant of growth in standard growth model as espoused by Solow (1956) and Mankiw et al. (1992). In the same vein, infant mortality which is a proxy for human capital is considered as a flash indicator for human capital development in LDCs (Boone, 1996) and especially for Africa in view of its peculiarities (World Bank, 2010). Hence, the human capital variable is now been regarded as an important determinant of modern growth (Cheng & Zhang, 2008; Henderson & Russell, 2005). Also, Asiedu, Jin and Nandwa (2009) as well as Clist (2011) adopted GDP per capita

as the indicator for poverty and among the reasons advanced were its strongly correlated with most poverty indicators and as such this indicator could be considered as a broad measure of poverty in recipient countries and a better replacement for poverty headcount as a proxy for poverty. In the same vein, one of the most prominent growth variables i.e. initial incomes has been adopted to account for the income convergence in AMCs in line with the convergence thesis as noted by Ali and Isse (2005) and Burnside and Dollar (2000). To this end, it was observed as in Table 6 below that investment positively and significantly impact on economic growth at 1 percent significance level. Thus, it implies that a percentage increase in the Investment/GDP ratio results in 2.27 points increase, which connotes .02 percent increase in the economic growth rate of GDP. On the other hand, human capital which is often regarded as the twin sister of investment carries the anticipated negative sign but with no significance even at 10 percent significance level. The Table below provides detail information on the results.

Table 6. Panel result with Growth as dependent variable

Variable	Coefficient	T-ratio	P-value
Investment	2.271	3.448	0.001***
	(0.659)		
Human capital	-0.096	-0.115	0.909
	(0.836)		
Poverty	21.947	6.358	0.000***
	(3.452)		
Initial income	-22.724	-6.776	0.000***
	(3.354)		

Mean = 1.738; SD = 2.569; S.E. = 1.700; Adj. R^2 = 0.519; Observations = 56

Notes: The estimates are made based on SURE method. The standard errors are reported in parentheses. All the regressors are in natural logarithm. The parameters for all variables are significant at 1% significance level (i.e. ***) and only human capital is insignificant even at the least significant level of 10%.

However, poverty proxy by per capita GDP was significant at 1 percent but with positive sign. It is however not surprising for African countries, which suffers from high level of systemic corruption and fiscal recklessness that with high level of poverty, growth rate increases. Unfortunately, most African countries declare high growth yet; there is high level of poverty in the continent. A good case in point is Nigeria, which perhaps has the highest level of average growth among the AMCs (see Table 2) but suffers from high level of poverty of almost 60 percent i.e. "poverty amidst plenty". Certainly, this is the paradox of development in African countries as noted by Collier (2006) and Desai (2002). Notwithstanding the above analysis on poverty, the result of initial income indicates a level of convergence in AMCs. This is because, the initial income coefficient shows the anticipated negative sign and with a very significant p-value at 1 percent significance level. This finding is consistent with theoretical proposition and empirical findings, which is indeed a validation of the convergence thesis as noted in the works of Burnside and Dollar (2000), Levine et al. (2000) and Ali and Isse (2005). Moreover, the adjusted R^2 shows that the explanatory variables employed account for 51.9 percent growth rate. To this end, it could be concluded that the DA of IDB positively impact on the economic growth of AMCs through investment as a transmission mechanism. This conclusion is consistent with previous findings, which observed that foreign aid positively impact on the economic growth of African countries through investment as the major transmission mechanism, which is a confirmation of the aid effectiveness hypothesis in Africa. This finding is consistent with previous findings as evidenced in the works of Gyimah-Brempong (1992) and Loxley and Sackey (2008).

4.2.2 Investment as the Dependent Variable

From Table 7 below, the result for investment as the dependent variable in our SEM framework is presented. The growth variable shows a symbiotic and bidirectional relationship and causality with investment as evident on our earlier submission about the positive impact of investment on growth (see Table 6). Now, growth also shows positive and significant impact on investment at 5 percent significance level; although, the impact of investment is higher (i.e. at 1 percent significance level). On the other hand, the result of human capital proxy by infant mortality carries the expected negative sign but with no significant impact on investment even at 10 percent significance level. In the same vein, the poverty variable also has the anticipated negative sign but with no significance. The plausible reason for this result could be that investment was largely financed by foreign aid and not from the domestic savings. This is what the result of AID impact on investment implies in the table presented below. The impact of AID on

investment indicates positive and significance level at the best significance level of 1 percent, which is highly commendable and certainly good for the economic growth process of AMCs.

Table 7. Panel result with Investment as dependent variable

Variable	Coefficient	T-ratio	P-value
Growth	0.036	2.093	0.041**
	(0.017)		
Human capital	-0.181	-0.155	0.254
	(0.157)		
Poverty	-0.014	-0.180	0.858
	(0.076)		
AID	0.116	2.989	0.004***
	(0.039)		

Mean = 2.923; SD = 0.394; S.E. = 0.297; Adj. R^2 = 0.374; Observations = 56

Notes: The estimates are made based on SURE method. The standard errors are reported in parentheses. With the exception of growth, all the regressors are in natural logarithm. The parameters of growth and AID are both significant at **(5%) and *** (1%) significance levels respectively.

The coefficient of AID, which is 0.116 connotes that a one-unit increase in the AID/GDP ratio results in an average of 0.12 percent increase in the investment rate of AMCs. By extension, it means that AID increased the investment rate of AMCs by an average of 0.12 percent, which is a commendable boost for AMCs economies in view of the poverty level and poor culture of savings, which are serving as impediments to the investment drive of most AMCs economies in the last few decades. Therefore, our result that foreign aid positively impact on the investment drive of AMCs is consistent with the findings of Gyimah-Brempong (1992), Hansen and Tarp (2001) as well as Loxley and Sackey (2008). In view of this finding, we conclude therefore that the DA of IDB positively impact on the investment drive of AMCs.

4.2.3 Human Capital as the Dependent Variable

The results in Table 8 presents the impacts of the various variables utilized in regressing human capital as an endogenous variable in the SEM framework. The growth variable shows a positive sign with no significant impact on human capital even at the 10 percent significance level. This shows that the contribution of growth to human capital is not commensurate with investment; whereas both are major contributors and engines of growth. Also, investment carries negative sign with no significant impact on human capital, which is similar to our earlier result in Table 7 of no significant impact of human capital on investment. Notwithstanding, the education variable which is the proxy for primary school enrolment indicates a negative sign at a strong significance level of 1 percent. In fact, the coefficient and parameter of this variable show the best result with respect to infant mortality. Thus, the result implies that the higher the level of primary school enrolment the lower the infant mortality in AMCs. This finding is consistent with conventional economic wisdom that high level of literacy impacts positively on the well-being of the society, especially in terms of health matters, which confirmed the view of Gujarati (2006). This result lends credence to the empirical findings of Boone (1996) as well as Gyimah-Brempong and Asiedu (2008) that foreign aid contributes to human capital development. The detail results are presented in Table 8 below.

Table 8. Panel result with Human Capital as dependent variable

Variable	Coefficient	T-ratio	P-value
Growth	0.025	1.410	0.165
	(0.017)		
Investment	-0.185	-1.318	0.194
	(0.141)		
EDU	-0.555	-4.717	0.000***
	(0.118)		
AID	-0.148	-3.655	0.001***
	(0.041)		

Mean = 4.281; SD = 0.516; S.E. = 0.314; Adj. R^2 = 0.591; Observations = 56

Notes: The estimates were made based on SURE method. The standard errors are reported in parentheses. With the exception of growth, all the regressors are in natural logarithm. The parameters for EDU and AID are both significant at 1% significance level (***).

5. Conclusion and Recommendation

The main objective of this study is to empirically investigate whether the DA of IDB impact positively and significantly on the economic growth of AMCs, which is perhaps the first study of its kinds on IDB foreign aid activities and operations in Africa. Importantly, from the foregoing presentations of the SEM results for the three endogenous variables i.e. growth, investment and human capital, it is obvious that the outcomes demonstrate positive and significant result for all the three endogenous explanatory variables. This means that foreign aid has positive and significant impact on growth in AMCs and it occurred through investment as the major transmission mechanism. In the same vein, foreign aid demonstrates positive and significant impact on investment and hence, our hypothesis that the DA of IDB positively impact on the investment drive of AMCs is confirmed. More so, the direct impact of foreign aid on human capital shows a significant contribution of an average of 0.15 percent decrease in the infant mortality, which according to Boone (1996) is a flash indicator for human capital development. Therefore, we also conclude that the DA of IDB has positive impact on the human capital development in AMCs. This result is consistent with the finding of Gyimah-Brempong and Asiedu (2008) and more particularly with the submission of Pramanik (2003) that IDB needs to focus primarily on the development of human capital in its member countries, in order to attain the goal of competitive cooperation and maximization of economic efficiency in Muslim countries. To this end, the central thesis of this research is that since the development assistance of IDB contributes positively to the economic growth and development process of African Muslim Countries, it implies therefore that foreign aid has a positive impact on economic growth, which confirms the aid effectiveness hypothesis in Africa. Interestingly, our empirical findings confirmed our theoretical proposition that the impact of foreign aid on economic growth is an indirect relationship through investment and human capital transmission mechanisms/channels. To this end, Africa development partners like the IDB should therefore make it a policy priority to scale-up aid by making a "big push" into the continent, so as to fast track the growth and development process and more especially for the realization of the Africa's twin challenges of MDGs and the IDB 1440H Vision. Against this background, we recommend that problems like endemic corruption, bad governance and collapse of basic infrastructures among others in AMCs should be areas of major focus by the IDB and other development partners of the continent like OECD, DFID, OPEC and a host of others. This is to preclude the African growth paradox of "excessive wealth, excessive poverty" from its continuous occurrence and damage. Therefore, for the development assistance of IDB to continue to make meaningful and purposeful contributions to the growth and development process of the African continent, the principle of aid selectivity must be adopted and adhered to. This is necessary and highly important if foreign aid must be delivered to reinforce a virtuous cycle of development in contradistinction to promoting a vicious cycle of poor governance and economic backwardness as noted by Brautigam and Knack (2004). This scenario is likely to be the fate of the DA of IDB in the nearest future if the principle of aid selectivity is not incorporated as a substantive principle in the IDB policy philosophy on its development assistance in view of the endemic corruption and bad governance that are almost becoming permanent characteristics of most African countries.

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Relationships between Organizational Factors and Political Behaviour Tactics in the Islamic Republic of Iran: Kerman Province

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Abstract

The organizations try to achieve their goals through using resources such as material and human resources, but most of them are a little successful to achieve their goals, however it is difficult to use the resources in order to achieve to personal and group gains that occur in the organization repeatedly. These actions called as political behavior include activities that go forward in order to work in the people or groups to obtain the protecting the personal gains when there are opposite solutions.

In the present paper, the researcher studies the relationship between the organizational factors and the political behaviors or the policy in the Kerman's governmental organizations. This study to be done by juncture studies and correlative way in the population includes 1992 samples of the Kerman's governmental organizations personnel and classified random sampling that include 322 samples. The researcher uses two questionnaires in order to gather the date and consult with the professors in order for determining the reliability questionnaires and evaluates them through re-examining and finally analyzes the collected data by means of software"SPSS". The results of this study show that there is a relationship between the organizational factors and the personnel's tendency toward the political behavior.

Keywords: organization, political behavior, organizational factors and tactics

1. Introduction

The political action is the one of the organization's characteristics, because the most organizations employ a lot of people who possess individual characteristics, but the type of the political behavior is very different. However, we accept this fact that the individual differences can play important role in the political scenes, the present evidence and documents verify this fact that some situations and specified cultures cause to develop and comfort special political behavior. (Robbins & Judge, 2007, p.748). Today world doubtlessly is full of complexes, obscurities, unbelief's and situations that are full of struggles,competitions and interference,the situation of the organizational policies and tactics in these conditions can involve potentially the consequences in the battle field between gains and goals of the organizational different activities and the combination of the coalition authority's process and influence in the organizations internal and external fields exposed to the drastic changes. The goals and gains of the organization's personnel are not in the single file and necessarily they will not conform to each other. It seems that the most of social activists in the organizations at longest head the achievement of goals and their personal gains and utilize the skills and methods of the political behaviors(Monavariyan & Alikhani, 2001, p. 73).

Up to now, the organizations have observed in the different ways that the most important ways are two principals: the political and the rational ways. According to rational attitude, the organization tries to achieve the explicit and specified goals. When a decision will be made then the goal is determined and the vary solutions are identified then the best solution is choose. But according to political attitude, the organization comprises the coalitions that not agree with the goals. The organizations political pattern consist of groups that possess separate and special their own gain, goals and values. In the organizations, the interference and the disagreement take into account a common task(Nasresfahani, 1997, p. 24)

Even though, it is impossible to omit practically the political operation within the organization, but the management can decrease its consequences. So the management has a mind when and how they can decrease and utilize it usefully within the organization in order to achieve their goals or the submissiveness of ethical pattern and the political behaviors tactics develop the personals motivation (Ghasemi, 2003, p. 376). The organization is a set of people that their roles is operating the tasks and duties that be assigned. In order to avoid damaging the organization, the political tactics should be put to use so that it develops the clear and friendly relationship between the organization and its personnel's and the organizations resources not to be wasted and the trust not to be decreased.

2. Methodology

According to the topic of the study: A Survey of the Relation between the Organizational Factors and the Political Tactics in Kerman's Governmental Organization. The descriptive research is type of the correlation that has been done in this research, since in the descriptive research, variables are be described precisely and completely and in the same way they do. The study is an applied research because of its goal and researcher uses Delfi's different techniques in the different steps of the research. In this study, the sampling way is a cluster sampling, and fit the population size because the number of personnel and organizations is not equal and every organization personnel should be participate in the sampling according to their proportion in the organizations population. So the number of sample is 321 individuals in the present study that they have chosen randomly through the population including 1991 individuals.

Kochran's formulate

$$n= \frac{T^2pq/d^2}{1+1/N\,[t^2pq/d^2-1]}$$

N = population size

P = Distribution's percentage of the characteristics.

Q = Individuals percentage lacking of that characteristics.

t= Variable size in natural distribution.

d = Difference between real proportion of the characteristics in the population and the researchers amount of estimation to occur that characteristic in the population.

$$n= \frac{(1.96)^2\times0.05\times0.5/0.05^2}{1+1/1991[(1.96)^2\times0.05\times0.5/0.05^2-1]}$$

$$n= \frac{384}{1.193} =321$$

3. Hypothesizes

1. The second allocation of the sources relates with the political behaviors tactics.
2. The opportunity for promotion in the organization relates with the political behaviors tactics.
3. The low level of trust in the organization relates with the political behaviors tactics.
4. The unclear system of evaluating the personnel's operation the political behaviors tactics.
5. The making democratic decision (group decision) relates with the political behaviors tactics.
6. The unclear rules (lack of tasks explanation) relate with the political behaviors tactics.
7. The intense pressure in order to improve the personnel's operation relates with the political behaviors tactic.

4. Results

Ho = There is not any relationship between the organizational factors and the political behavior tactics.

H ı= There is a relationship between the organizational factors and the political behavior tactics.

Table 1. Correlation coefficient between the organizational factors and the political behavior

Significant level tactics	E.S Pearson correlation coefficient
0.001	0.195

Table one shows the correlation coefficient between the organizational factors and the political behavior.

According to above table, the amount of the calculated test is significant. It means the amount of **sig** is less than 0.05, so the null hypothesis is rejected and the alternative hypothesis with reliability of 0.95 percent is accepted. The Pearson correlation coefficient between"the organizational factors and the political behavior tactics is +0.195 with significant level of sig = 0.001. So there is a relationship between the organizational factors and the political behavior tactics.

Table 2. Brief model for the organizational factors

Standard error grade	Adjusted R^2	R^2	R	Model
8.08764	0.035	0.038	0.195	1

Table two shows the brief model for the organizational factors. The Pearson correlation coefficient between these two variable equal +0.195 and coefficient of determination (R^2) equal 0.035. On the other hand, the organizational factors explain the 3.5 percent of the political behavior tactics changes.

Ho= There is not any relationship between the second allocation of resources and the political behavior tactics.
H_1= There is a relationship between the second allocation of resources and the political behavior tactics.

Table 3. Correlation coefficient between the second allocation of resources and the political behavior tactics

Significant level	Pearson correlation coefficient
0.000	0.224

Table three shows correlation coefficient between the second allocation of resources and the political behavior tactics. As regard to above table, the amount of the calculated test is significant. It means the amount of sig is less than0.50, so the null hypothesis is rejected and the alternative hypothesis is accepted with reliability of 0.95 percent. The Pearson correlation coefficient between the political behavior tactics and the second allocation of the resources is +0.224 and sig=0.000. So there is a relationship between the second allocation of resources and the political behavior tactics.

Table 4. Brief model for second allocation of resources

Standard error grade	Adjusted R^2	R^2	R	Model
8.03753	0.047	0.050	0.224	1

Table 4 shows the brief model for second allocation of resources. The Pearson correlation coefficient between these two variable equal +0.224 and coefficient of determination (R^2) equal 0.050. On the other hand, amount of the second allocation of the resources can explain 4.7 percent of the political behavior tactics changes.

Ho= There is not any relationship between the promoting in the organization and political behavior tactics.

H_1= There is a relationship between promoting in the organization and political behavior tactics.

Table 5. Correlation coefficient between the opportunity to promote in the organization and political behavior tactics

Significant level tactics	Correlation coefficient
0.134	0.088

Table 5 shows the correlation coefficient between the opportunity to promote in the organization and political behavior tactics. According to above table, the amount of the calculated test is not significant. It means the amount of sig is less than0.05, so the null hypothesis is accepted and the alternative hypothesis with reliability of 0.95 percent is rejected. The Pearson correlation coefficient between the behavior tactics and the opportunity to promote in the organization is +0.088 with the significant level of sig= 0.134. So there is not any relationship between the opportunity to promote in the organization and the political behavior tactics.

Ho= There is not any relationship between the low level of the trust in the organization and the political behavior tactics.

H_1= There is a relationship between the low level of the trust in the organization and the political behavior tactics.

Table 6. Correlation coefficient between the low level of the trust in the organization and the political behavior

Significant level tactics	E.S Pearson correlation coefficient
0.002	0.184

Table 6 shows the correlation of efficient between the low level of the trust in the organization and the political behaviors. According to above table, the amount of the calculated test is significant. It means the amount of sig is less than0.05, so the null hypothesis is rejected and the alternative hypothesis with reliability of 0.95 percent is accepted. The Pearson correlation coefficient between"the low level of the trust in the organization" and the political behavior tactics is +0.184 with significant level of sig=0.002. So there is a relationship between the organizational factors and the political behavior tactics.

Table 7. Brief model for the low trust in the organization

Standard error grade	Adjusted R^2	R^2	R	Model
8.10588	0.031	0.034	0.184	1

Table 7 shows the brief model for the low trust in the organization. The Pearson correlation coefficient between these two variable equal +0.184 and coefficient of determination (R^2) equal 0.034. On the other hand, the low trust in the organization explains the 3.4 percent of the political behavior tactics changes.

Ho= There is not any relationship between the undetermined system of evaluating the personnel's operation and the political behavior tactics.

H_1= There is a relationship between the undetermined system of evaluating the personnel's operation and the political behavior tactics.

Table 8. Correlation coefficient between the undetermined system of evaluating the personnel's operation and the political behavior

Significant level tactics	E.S Pearson correlation coefficient
0.012	0.147

Table 8 shows the correlation coefficient between the undetermined system of evaluating the personnel's operation and the political behaviors. According to above table, the amount of the calculated test is significant. It means the amount of sig is less than0.05, so the null hypothesis is rejected and the alternative hypothesis with reliability of 0.95 percent is accepted. The Pearson correlation coefficient between"the undetermined system of evaluating the personnel's operation" and the political behavior tactics is +0.147 with significant level of sig=0.012. So there is a relationship between the undetermined system of evaluating the personnel's operation and the political behavior tactics.

Table 9. Brief model for the undetermined system of evaluating the personnel's operation

Standard error grade	Adjusted R^2	R^2	R	Model
8.15669	0.018	0.022	0.147	1

Table 9 shows the brief model for the undetermined system of evaluating the personnel's operation.The Pearson correlation coefficient between these two variables equal +0.147 and coefficient of determination (R^2) equal 0.022. On the other hand, the undetermined system of evaluating the personnel's operation explains the 2.2 percent of the political behavior tactics changes.

Ho= There is not any relationship between the democratic decisions (group decisions) and the political behavior tactics.

H_1= There is a relationship between the democratic decisions (group decisions) and the political behavior tactics.

Table 10. Correlation coefficient between the democratic decisions (group decisions) and the political behavior

Significant level tactics	E.S Pearson correlation coefficient
0.016	0.140

Table 10 shows the correlation coefficient between the democratic decisions (group decisions) and the political behavior. According to above table, the amount of the calculated test is significant. It means the amount of sig is less than0.05, so the null hypothesis is rejected and the alternative hypothesis with reliability of 0.95 percent is accepted. The Pearson correlation coefficient between" the democratic decisions and the political behavior tactics is +0.140 with significant level of sig=0.016. So there is a relationship between the organizational factors and the political behavior tactics.

Table 11. Brief model for the democratic decisions

Standard error grade	Adjusted R^2	R^2	R	Model
8.16524	0.016	0.020	0.140	1

Table 11 shows the brief model for the democratic decisions. The Pearson correlation coefficient between these two variables equal +0.140 and coefficient of determination (R^2) equal 0.020. On the other hand, the organizational factors explain the 2 percent of the political behavior tactics changes.

Ho= There is not any relationship between the undetermined roles and the political behavior tactics.

H_1= There is a relationship between the undetermined roles and the political behavior tactics.

Table 12. Correlation coefficient between the undetermined roles and the political behavior

Significant level tactics	E.S Pearson correlation coefficient
0.022	0.133

Table 12 shows the correlation coefficient between the undetermined roles and the political behavior. According to above table, the amount of the calculated test is significant. It means the amount of sig is less than0.05, so the null hypothesis is rejected and the alternative hypothesis with reliability of 0.95 percent is accepted. The Pearson correlation coefficient between" the undetermined roles and the political behavior tactics is +0.133 with significant level of sig=0.022. So there is a relationship between the undetermined roles and the political behavior tactics.

Table 13. Brief model for the undetermined roles

Standard error grade	Adjusted R^2	R^2	R	Model
8.17287	0.014	0.018	0.133	1

Table 13 shows the brief model for the undetermined roles .The Pearson correlation coefficient between these two variables equal +0.133 and coefficient of determination (R^2) equal 0.018. On the other hand, the undetermined roles explain the 1.8 percent of the political behavior tactics changes.

Ho= There is not any relationship between the intense pressures in order to improve the personnel's operation and the political behavior tactics.

H_1= There is a relationship between the intense pressures in order to improve the personnel's operation and the political behavior tactics.

Table 14. Correlation coefficient between the intense pressures in order to improve the personnel's operation and the political behavior

Significant level tactics	E.S Pearson correlation coefficient
0.085	1.101

Table 14 shows the correlation coefficient between the intense pressures in order to improve the personnel's operation and the political behavior. According to above table, the amount of the calculated test is not significant. It means the amount of sig is more than0.05, so the null hypothesis is accepted and the alternative hypothesis with reliability of 0.95 percent is rejected. The Pearson correlation coefficient between"the intense pressures in order to improve the personnel's operation" and the political behavior tactics is +1.101 with significant level of sig=0.085. So there is not any relationship between the intense pressures in order to improve the personnel's operation and the political behavior tactics.

5. Discussion

In the recant century's world, the bases of the political behaviors differ from the real term"policy" and the purpose of the most political behaviors not related to the political bases and they only follow the economic or cultural purposes(Naji & Tabouli, 2010, p. 52). The individual and group political behaviors consisting of their efforts for influencing the others behavior and the course of the organizations events that accomplish for protecting the gains, to supply the needs and progress the goals. According this, all the types of behaviors usually can be considered as a political task. To label a behavior as a political movement entail a judgmental concept. It means that the individuals or groups accomplish this when they want to obtain something and get the points from the others, groups or organization, on the other hand the people often are self-centered in relation to label the behaviors operation by the others and represent it in political and believe that their political behavior is defensible. So they consider this behaviors as defending their rights and legal and lawful gains, while they construe this same behavior as a playing politics when is done by others. Doll, one of the political theorists, believes that the political behavior result from the conflicting intentions and ha says:" if an individual involve the other one in confliction and deprivation in order to seek his goals, the first store of the political behavior has been developed. The confliction and the policy are inseparable twist (Fakhimi, 2003, p. 140). The political behavior is an instrument by which the individuals try to achieve and apply the authority. In an easy sense, the individual's purpose of applying such behavior is finding out the exclusive way(Moorhead & Griffin, 2008, p. 394). There are a lot of definitions of the political behavior that some definitions are considered as follow:

Mayes and Allen: the political behavior includes having influence on the others through the legal methods to option the legal and legitimate results. Quinn: the political behavior consisting the activities that are applied mostly for increasing the legal power or the individual authority of the groups. Moghimi notify that: the political behaviors are the optional and impulsive influence of the individuals or groups in the opposite situation for increasing or protecting their own gains (Moghimi, 2006, p. 410). The political behavior in the organization consists of the operations that are considered just as the obligations of the individual's official role in the organization. But it influences on allocating the gains and losses within the organization. This definition includes the key elements that cover what the individuals often consider as the organizational policies (Robbins & Barnwell, 1998, p. 302). The tactics of the organizational policy that are to control the availability to information, to reinforce an ideal effect, to develop a backer base, to criticize the others to present oneself through authorities, to satisfy try to the others and to confederate the powerful allies and to arrange ethical obligations. Some of the political behaviors are naturally moral such as to utilize the legal instrument to increase power and authority, but some others are amoral (Durbin, 2003, p. 1). They are pointed to be cruel, to cans schism and govern, to keep away competitors and to be Effective factors on the political behaviors. The effective factors on the formation of the political behaviors can be divided into two groups: individual and organizational. The effective factors on the formation of the political behaviors are shown in Figure 1(Note 1).

6. Conclusion and Recommendations

The political behaviors can't be removed in the organization the manager who expects that nobody begin the political behavior. Seem to be naive, but the organizational maneuvers can be controlled. Abraham Zaleznik, the Harvard university a professor states"the people can focus on a number of special thing, so the more they focus on

the political behavior, the less rational and inspirational energy is remind in order to operate the real problems(Naji, 2010, p. 174). Therefore, the practical recommendations to manage the political include:

6.1 Reduce Uncertainty in the System

(1). Clarify the bases in the

(2). Differentiate the weak or great operation in paying bonus

(3). Make sure that the bonuses directly relate of the operation

6.1.1 Competition Reduction

(1). Try to reach a minimum in the competition between managers in order to obtain the resources.

(2). Try to substitute the long-term or short-term goals of supplying the resources the outside of the organization for obtain the resources.

6.1.2 To Break the Extant Political Band

(1). The powerful and stable emperors can be broken by means of removing or dividing the inefficient small groups.

(2). If you are executive manager, be sensitive to managers who their career is to gain the political supports first, warn these people that they must stop the political maneuvers, otherwise dismiss them and it is better to discharge them from the organization.

6.1.3 To Prevent Forming the Future Political Band

The political attitude that the organizational goals take priority over the individual power should be considered as the most important indicator of promoting the managers.

6.1.4 To Have Clear Communications

The clear communications is one of the very effective techniques in limiting the political behavior, so the existence of these communications prevent that everyone can control the communications and communicative lives.

6.2 To Study the Causes and Techniques of the Political Behaviors

Finally if manager knows the causes and techniques of political behavior, he can investigate its effects and controls the decision parameters and in supervisor's point of view, has the suitable knowledge to limit its effects. Generally, the keys for running the political behavior include: If a manager wants to be qualified politically and present the effective political behaviors, he should take some actions. If a manager wants to be qualified politically and present the effective political behavior, he should do a series of actions. Arrange departments around the organizational goals are important to present proper image of organization, to have control over the organizational resources, to be considered as a precious pearl, to be known and to avoid of corrupt people

6.3 Organizational Factors

6.3.1 Uncertainty and Obscurity

There is a high probability that the political behavior. Found in the environment in which no clear policy to be existed. As operating the organizational actions, the clear and prices law and rules reduce the probability of abusing the power. Uncertainty is an imperative condition for appearing the political behavior

6.3.2 Different and Contrary Preferences

The contrary preferences develop when the uncertainty is appeared in the most proper function.

6.3.3 Distributed Authorities

Whenever, all the groups which involved in the organization are possessed authority.

6.3.4 Organization's upward Levels

In the upward levels of the organization, the political behavior is more than the downward levels.

6.3.5 Less Trust

The less the trust, the more the political behavior intensify.

6.3.6 Win or Lose Culture or Zero Gathering Game

The more the organization emphasize on the win or lose culture, the more the personnel's motivation will be. If it is supposed that one party achieves to the goal by means of the other one's cost and the nature of this goal should be in a way that none of them can achieve to the goal that called zero gathering game

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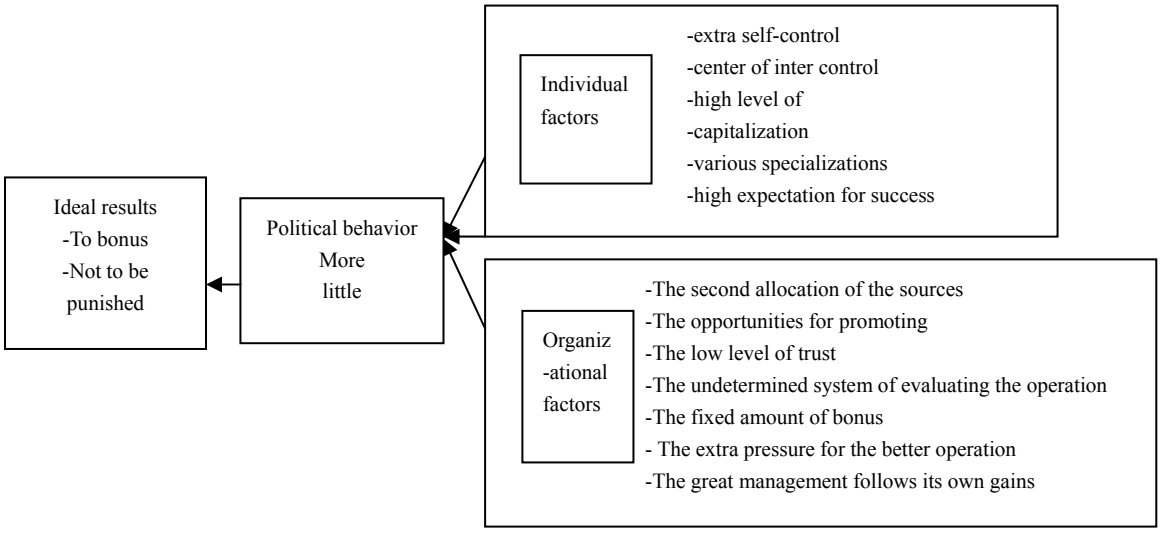
Notes

Note1. Figure 1 shows the effective factors on the formation of the political behaviors



(Robbins & Judge, 2007, p. 474)

Figure 1.

Home Bias in Equity Portfolios: Theory and Evidence for Developed Markets

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Abstract

Equity home bias is one of the most important puzzles in international finance. This paper tries to measure the home bias equity based on Warnock (2002). We find strong evidence for the phenomena in nine developed financial markets during 1969-2003. We then test the International Capital Asset Pricing Model (ICAPM) of Adler and Dumas (1983) in order to explain the home bias by inflation hedging. We also test ICAPM of Coën (2001) which includes inflation and human capital. Our findings suggest that these two models are rejected. The lack of international diversification in equity portfolios is still a puzzle in international finance.

Keywords: international portfolio diversification, home bias equity, global financial markets, financial integration

1. Introduction

At the national level, the portfolio theory of Markowitz (1959) showed that the inclusion of slightly correlated assets in a portfolio reduces significantly the risk. At the international level, the benefits of international diversification were highlighted since pioneer works of Grubel (1968), Levy and Sarnat (1970), Solnik (1974), etc. These benefits are allotted to weak correlation between financial markets.

With the financial globalisation, one would expect that investors diversify internationally their portfolios and take advantage of international diversification. However, investors present a strong preference for national assets. This behavior called home bias is not the fact of hazard, but has several explanations in the financial literature. The most common causes are asymmetric information, inflation risk, non traded assets, transaction costs and segmentation of financial markets.

In this paper, we will try in the first step, to measure the home bias in investor portfolios of nine developed countries during the period 1969-2003. In the second step, we use the model of Adler and Dumas (1983), to test whether the hedging inflation could explain the home bias. In the third step, we test the International CAPM developed by Coën (2001), to check if human capital risk generates the observed home bias.

2. Literature Review

The empirical studies on international portfolio diversification stipulate that the majority of equities are held by domestic investors. French and Poterba (1991) showed that the proportions of domestic equities in the five larger financial markets were respectively of 92.2% for United States, 95.7% for Japan, 92% for United Kingdom, 79% for Germany and 89.4% for France.

Lewis (1998) is based on a mean-variance model to explain the relation between averages and variances in international financial markets. Using a world represented by two markets, the US market and index EAFE (Note 1), the optimal portfolio indicates that, for a low level of risk aversion, American investor should choose a portfolio with 39.75% of foreign securities. This weighting would pass to 39.45% for higher levels of risk aversion. These results suggest the presence of a strong home bias for any level of risk tolerance.

Harvey (1993) examined the returns of 20 emerging markets and showed that the standard models based on integrated capital markets don't explain the equity returns in these countries; He concluded that models based on market segmentation are more suitable than models based on market integration.

Cooper and Kaplanis (1994) proposed a model of international portfolio choice which integrates the deviations from Purchasing Power Parity and deadweight costs. They showed that the barriers to international investment don't constitute a crucial factor limiting the attraction of international diversification.

Vassalou (2000) tested the models of Grauer, Litzenberger and Stehle (1976), Solnik (1974) – Sercu (1980) and Adler and Dumas (1983), He reported that, the home bias cannot be caused by the desire of investors to hedge against price uncertainty.

Kang and Stulz (1997) investigated stock ownership in Japanese firms by non Japanese investors from January 1975 to December 1991, they documented that the preference of domestic stocks results from an information asymmetry between domestic and foreign investors.

Choe, Kho and Stulz (2001) examined the question of whether domestic investors have better information than foreign investors. Using Korean data from December 1996 to November 1998, the authors found a difference in the performance of domestic and foreign investors.

Bellalah and Aboura (2006) proposed a capital asset pricing model in presence of asymmetry information and transaction costs. The test results over the period 1991-2000, showed that the information costs were negatively correlated with the expected return.

Barron and Ni (2008) studied the impact of asymmetric information on equity home bias in international finance. By developing a rational anticipation model where information acquisition is endogenous, the authors found a relation between the portfolio size, the information cost and the degree of home bias in each country.

Amadi and Bergin (2008) constructed a portfolio allocation model with various configurations of the trading costs. They showed that turnover rates tend to be higher among foreign compared to domestic holdings. In the same way, they demonstrated that the presence of agents that confront different trading cost produced a notable home bias.

Mondria and Wu (2010) developed a model where investors face an information constraint and have a local informational advantage. The results indicate that the home bias remains important in the long run because of the interaction between information and portfolio choices. The empirical tests support the principal predictions of the model that bias increases with information capacity and decreases with financial integration.

Baxter and Jermann (1997) analyzed the empirical implications of non traded assets on portfolio choice for an US investor investing in four countries during the period 1970 -1991; they found that the home bias worsens with human capital risk.

Coën (2001) developed an International CAPM with human capital and deadweight costs. The empirical tests suggested that the non traded assets don't give an explication to the home bias puzzle.

3. Theoretical Models

3.1 The Model of Adler and Dumas (1983): The Inflation Hedging

To explain the home bias puzzle by the motive of inflation hedging, we use the model of Adler and Dumas (1983), which supposes that in a world of L+1 countries (and currencies) and N risky assets , the nominal returns R_i , measured in terms of (L+1) th currency (Note 2) , follow a stationary process of Itô :

$$R_i = \mu_i dt + \sigma_i dz_i, \quad i:1,...,N \tag{1}$$

Where;

μ_i : The instantaneous expected nominal return of security i;

σ_i : The instantaneous risk of security i;

dz_i : The increment to a standard Gauss Wiener process.

The model also supposes that there are L+1 investor types, the inflation rate of an investor expressed in currency l follows a stationary process:

$$p^l = \pi^l dt + \sigma_\pi^l dz_\pi^l, \quad l:1,...,L+1 \tag{2}$$

Where;

π^l : The expected instantaneous inflation rate of an investor l ;

σ_π^l : The standard deviation of instantaneous inflation rate;

dz_π^l : The increment to a standard Gauss Wiener process.

Basing on these two assumptions, Adler and Dumas (1983) showed that each investor in the world holds a portfolio composed of two funds: the first is a common portfolio to all investors and the second is a portfolio of hedging against inflation. The vector of the proportions invested in each risky security is:

$$x^l = \alpha^l \Omega^{-1}(\mu - r\underline{1}) + (1-\alpha^l)\Omega^{-1}\omega^l \quad (3)$$

Where;

x^l : (N×1) vector of the proportions invested in each risky security for investor;

α^l : Risk tolerance of investor l (the reverse of risk aversion);

Ω : (N×N) instantaneous covariance matrix of nominal returns on various assets;

r : The instantaneous rate of return of riskless asset;

ω^l :(N×1) Vector of covariances of N risky asset returns with investor 's inflation rate ;

$\underline{1}$: (N×1) vector of ones.

To estimate the equation (3), we will follow the methodology of Cooper and Kaplanis (1994), we thus suppose that the risk tolerance is identical for all investors, $\alpha^l = \alpha$ expected returns can be eliminated with the aggregation condition:

$$\sum_l x^l v^l = e \quad (4)$$

Where;

v^l : The proportion of the country l 's wealth in the world wealth for L 1 country;

e : a vector whose l th component represents the proportion of country l 's market capitalization in the worldwide market, for $l = 1,..., L+1$ ($e^l = 0$ for $l > \mathrm{L}+1$).

Using relations (3) and (4), we can write (Note 3):

$$(x^l - e)/(1-\alpha) = \Omega^{-1}\left[\omega^l - \sum_l x^l \omega^l\right] \quad (5)$$

This equation indicates that the deviations of investor portfolio from the worldwide portfolio are proportional to a vector of regression coefficients. Cooper and Kaplanis (1994) suggest that the multiple regression of the variable $(p^l - \sum_l y^l p^l)$, measuring the deviations of investor inflation rate from world inflation on the vector of nominal asset returns, present coefficients equal to the equation (5).

3.2 The Model of Coën (2001): Introduction of Human Capital

The objective is to test if the introduction of human capital into an International CAPM, explains domestic bias. For that, we will base our analysis on the model of Coën (2001) which takes into account the existence of human capital. To derive his model, the author introduced the assumption that human capital return (wages) of the investor follows a stationary process:

$$\frac{dH^l}{H^l} = \mu_h^l dt + \sigma_h^l dz_h^l \quad (6)$$

Where;

H^l : The wage value of investor l;

μ_h^l : The instantaneous expected rate of variation of the wage;

σ_h^l : The standard deviation of the instantaneous rate of the wage;

z_h^l : A standard Wiener Process;

dz_h^l : A white noise.

The author also supposes that the total income of each investor comes from financial resources and human capital with respective proportions $(1-\phi)$ and ϕ. Using the principle of Bellman to solve this problem, Coën (2001) derives the relation of the optimal portfolio:

$$x = \frac{\alpha}{(1-\phi)}\left[\frac{\Omega^{-1}(\mu - r\underline{1})}{1 - \underline{1}'\Omega^{-1}(\mu - r\underline{1})}\right] + \frac{(1-\alpha)}{(1-\phi)}\left[\frac{\Omega^{-1}\omega}{1 - \underline{1}'\Omega^{-1}\omega}\right] - \frac{\phi}{(1-\phi)}\left[\frac{\Omega^{-1}\underline{\kappa}}{1 - \underline{1}'\Omega^{-1}\underline{\kappa}}\right] \quad (7)$$

Where;

κ : (N×1) Vector of covariances $\sigma_{i,h}^{l}$ of N risky asset returns with investor's rate of change of the wage.

Thus, the optimal portfolio of individual investor becomes a combination of three funds:

- The logarithmic portfolio which is common for all investors;
- The personalized hedge portfolio which constitutes the best hedging against inflation for the investor l;
- The personalized hedge portfolio personalized which constitutes the best hedging against the variation of the wage.

Using a method identical to that presented in the preceding section, we obtain the following relation:

$$(x^{l} - e) = \frac{(1-\alpha)}{(1-\phi)}\Omega^{-1}\left[\omega^{l} - \sum\nolimits_{l} y^{l}\omega^{l}\right] - \frac{\phi}{(1-\phi)}\Omega^{-1}\left[\kappa^{l} - \sum\nolimits_{l} y^{l}\kappa^{l}\right] \quad (8)$$

This equation indicates that the deviations of investor's portfolio from the worldwide portfolio are proportional to two vectors of the coefficients of regression. This equation differs from the equation (5) where, the second term is related to wages.

4. Empirical Results

4.1 Data Description

The data base is consisted on the equity market returns, the consumption price indices and the labor income rates for Canada, France, Italy, Japan, Netherlands, Spain, Sweden, United Kingdom and United States. The stock market indices are provided by Morgan Stanley Capital International Perspective [MSCI].and expressed in American dollar (the L+1st currency).

Market capitalizations at December 31st, 2003 come from World Federation of Exchanges and MSCI. The data on domestic and foreign holdings of investors are extracted from Coordinated Portfolio Investment Survey published by International Monetary Fund [IMF].

The price indexes as well as the labor income rates (used as proxy of the human capital) are from the International Financial Statistics of IMF.

The data used are of monthly frequency for the period December 1969 to December 2003.

4.2 Measure of Equity Home Bias

Warnock (2002) proposed a measure of equity home bias so that the bias is equal to zero if the share of investor l's portfolio in domestic securities is equal to the share of the country l in world portfolio. If it is equal to 1, the investors hold only domestic securities.

$$\text{Home bias} = 1 - \frac{\text{Share of foreign equities in investor's portfolio}}{\text{Share of foreign equities in world portfolio}} \quad (9)$$

We measure the investor portfolio by domestic market capitalization plus the value of equities held by domestic investors abroad minus the value of equities held by foreign investors in domestic country.

We consider that world market capitalization is the sum of market capitalizations of the 9 developed markets of our sample. Table 1 presents the components of the bias variable for the 9 countries:

Table 1. Home Bias Measures (at December 2003)

Country	Share of country l in world market capitalization	Share of domestic equities in investor l's portfolio	Share of foreign equities in investor l's portfolio	Home bias equity
Canada	0.043	0.744	0.256	0.733
France	0.036	0.480	0.620	0.461
Italy	0.030	0.580	0.420	0.568
Japan	0.144	0.899	0.101	0.882
Netherlands	0.021	0.243	0.757	0.227
Spain	0.035	0.874	0.226	0.870
Sweden	0.014	0.596	0.404	0.591
United Kingdom	0.120	0.676	0.424	0.632
United States	0.554	0.828	0.172	0.615
Total	1			

The results of table 1 show a strong preference by investors for domestic equities. The bias is positive and exceeds 0.5 for all the countries, except for the Netherlands and France. This phenomenon is very important for Canada, Japan and Spain.

4.3 Home Bias Test with Inflation Hedging

We run the regressions with coefficients corresponding to the right-hand side members of the equation (5):

$$(p^l - \sum v^l p^l)_t = b_{0l} + \sum_{i=1}^{N} b_{1l} R_{it} + u_t^l \quad l = 1,..., L+1 \tag{10}$$

The lth coefficient of this regression is an estimate of the domestic bias divided by one minus the risk tolerance. Therefore, $b_{ll} = \frac{(x^l - e^l)}{(1-\alpha)}$ can be rewritten as follows:

$$b_{ll} = \frac{\gamma_l (x^l - e^l)}{(\gamma_l - 1)} \tag{11}$$

Where;

$$\gamma_l = \alpha_l^{-1}$$

We substitute for b_{ll} in the equation (10) and we use the wealth of each country as a proxy of market capitalization, we obtain:

$$(p^l - \sum e^l p^l)_t = b_{0l} + \sum_{i \neq l}^{N} b_{1l} R_{it} + \frac{\gamma_l (x^l - e^l)}{(\gamma_l - 1)} R_{it} + u_t^l \tag{12}$$

We estimate the coefficients of risk aversion by using the generalized moment method (GMM) of Hansen (1982), which corrects heteroscedasticity and serial correlation. In this case, we use the returns as instrumental variables. Before presenting the results of this regression, we expose some descriptive statistics for inflation deviations of different countries. This variable is the difference between inflation rate of a country l and the average of inflation rates of the 9 countries.

Table 2. Descriptive statistics of inflation deviations

Country	Mean	Standard Deviation	Autocorrelations					
			ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
Canada	-0.00017	-0.00017	0.095	-0.047	0.005	0.102	0.334	0.280
France	0.00022	0.00012	0.357	0.217	0.233	0.179	0.290	0.191
Italy	0.00251	0.0018	0.441	0.334	0.269	0.251	0.328	0.385
Japan	-0.0013	-0.0017	0.148	-0.073	0.059	0.060	0.405	0.387
Netherlands	-0.00096	-0.00098	0.201	0.114	-0.110	0.095	0.549	0.389
Spain	0.00278	0.00181	0.263	0.098	0.009	0.106	0.322	0.276
Sweden	0.000621	0.00015	0.120	0.060	-0.018	-0.014	0.239	0.209
United Kingdom	0.0015	0.0007	0.235	0.113	0.055	0.047	0.447	0.334
United States	-0.00029	2.22E-05	0.218	0.035	0.188	0.108	0.509	0.417

It is deduced from the table 2 that inflation deviation is positive for Spain, France, Italy, the United Kingdom and Sweden. It is however more important for Spain and Italy where inflation is higher than the average of the countries. The coefficients of autocorrelation of first order are significantly different from zero for all the countries, which show the predictable character of the inflation rates. The results of estimate of the equation (12) are given in table 3.

Table 3. Test of home bias by the motive of inflation hedging

Country	γ_l	Standard Deviation of γ_l	$\left(x^l - e^l\right)$	Probability that $b_{ll} > 0$ and $\gamma_l > 0$
Canada	0.013618	0.010081	0.701	0.000
France	0.003347	0.003248	0.444	0.000
Italy	-0.009436	0.009192	0.556	0.000
Japan	-0.019982	0.014516	0.550	0.000
Netherlands	0.006670	0.007138	0.755	0.000
Spain	0.012607	0.009951	0.839	0.000
Sweden	-0.003352	0.006189	0.582	0.000
United States	-0.005853	0.018709	0.274	0.000
United Kingdom	0.003026	0.015344	0.222	0.000

The estimates of risk aversion coefficients are very weak. Concerning the hypothesis which corresponds to the hedging inflation, we require that $b_{ll} > 0$, which indicates that the return of domestic financial market is positively correlated with inflation rate and that $\gamma_l > 0$, meaning a positive risk aversion. For each country, we test the joint hypothesis that $b_{ll} > 0$ and $\gamma_l > 0$

Where;

x^l: The proportion of the portfolio invested in domestic financial;

e^l: The proportion of the country l in world market capitalization;

γ_l **:** The estimate of the relative risk aversion coefficient;

The autocorrelation and the heteroscedasticity of errors are corrected by the test of Newey and West (1987) with 12 lags corresponding to the periodicity of series. The last column of table 3 presents the probability that the domestic bias is caused by the hedging inflation risk. For all the countries, there is a null probability that the joint hypothesis is validated. Therefore, the hedging of risk inflation does not explain the puzzle of domestic bias.

4.4 Test of International CAPM with Human Capital

We will adopt the same approach as that used previously. We thus consider the following system:

$$(p^l - \sum e^l p^l)_t = b_{0l} + (1-\phi)\left(\sum_{i \neq l}^{N} b_{1l} R_{it} + b\frac{\gamma_l (x^l - e^l)}{(\gamma_l - 1)} R_{it}\right) + \phi\left(\frac{\gamma_l}{\gamma_l - 1}\right)\left(h^l - \sum_l v^l h^l\right) + u_t^l \quad (13)$$

Where;

$$h^l = \frac{dH^l}{H^l}$$

Table 4. Test of home bias by the motive of inflation hedging and human capital

Country	γ_l	Standard Deviation of γ_l	$\left(x^l - e^l\right)$	Probability that $b_{ll} > 0$ and $\gamma_l > 0$
Canada	0.026455	0.019402	0.701	0.000
France	0.006292	0.006102	0.444	0.000
Italy	-0.044029	0.032741	0.550	0.000
Japan	0.015166	0.016130	0.755	0.000
Netherlands	0.005439	0.027514	0.222	0.000
Spain	0.024794	0.019281	0.839	0.000
Sweden	-0.006934	0.012849	0.582	0.000
United States	-0.010400	0.033398	0.274	0.000
United Kingdom	-0.016913	0.016584	0.556	0.000

The results show that for the 9 countries, b_{ll} and the coefficient of relative risk aversion, are not jointly significantly positive. There is a null probability that the joint hypothesis is true.

However, we note that the coefficients of relative risk aversion for Canada and Spain are significantly different from zero on the level of 5%. In spite of this result, we can conclude that the hedging of risk inflation and the hedging of changes in the wage can be rejected as an explanation of home bias puzzle. Our study is coherent with the preceding studies and in particular that of Baxter and German (1997).

5. Conclusion

The international financial literature showed that investors are under diversified in international securities. This behavior called home bias, presents several explanations in the financial literature.

In this paper, we choose to test the domestic bias by using the model of Adler and Dumas (1983) which takes into account the deviations from power parity.

We examined the hypothesis that the preference for national assets is caused by the inflation hedging, we thus tested the assumption that the stock exchange return of a country is positively correlated with its inflation rate and that the coefficient of risk aversion is strictly positive. By applying this model to nine developed countries, the results show that the hedging of domestic inflation doesn't explain the puzzle of home bias, for the period 1969-2003, which confirms the results of Cooper and Kaplanis (1994).

The recent studies underline the role of human capital in the portfolio choice, it is for this reason, we based on the study of Coën (2001), which constitutes an extension of Adler and Dumas (1983) in order to solve the puzzle of domestic bias by inflation hedging and human capital.

The model of Coën (2001) supposes that optimal portfolio is composed of three funds: the logarithmic portfolio, the inflation hedge portfolio and the hedge portfolio against change in labor income. A negative correlation between the return of human capital and the returns of national securities should increase the national bias.

The results of the test of International CAPM with human capital show that the hedging inflation risk and the changes of wages can't explain the puzzle of home bias. The presence of human capital is important in international portfolio choice however its contribution to the explanation of domestic bias is weak. It could thus be interesting to seek other explanations. Future research on domestic bias cannot ignore the role of transaction cost in country allocation decisions. Moreover, asymmetry of information between domestic and foreign investors is one of the important characteristics of financial markets and could contribute to explain the puzzle of home bias.

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Notes

Note 1. The US market represents the domestic market and index EAFE represents the foreign market.

Note 2. According to Adler and Dumas (1983), we also suppose that N+1 asset is nominally riskless and that N-L first assets constitute stock securities and the L last constitute bonds.

Note 3. Basing on equation (3), we can write:

$$e = \sum v^l \alpha_l \Omega^{-1} (\mu - r\underline{1}) + \sum v^l \ (1 - \alpha^l) \Omega^{-1} \omega^l$$

$$e = \Omega^{-1}\sum v^l \alpha(\mu - r\underline{1}) + (1-\alpha)\Omega^{-1}\sum v^l \ \omega^l$$

$$x^l - e = \Omega^{-1}\left[\alpha(\mu - r\underline{1}) - \sum \alpha(\mu - r\underline{1})v^l\right] + (1-\alpha)\Omega^{-1}\left[\omega^l - \sum v^l \ \omega^l\right]$$

$$x^l - e = \Omega^{-1}(\mu - r\underline{1})\left[\alpha - \sum \alpha v^l\right] + (1-\alpha)\Omega^{-1}\left[\omega^l - \sum v^l \ \omega^l\right]$$

$$x^l - e = \Omega^{-1}(\mu - r\underline{1})\left[\alpha - \alpha\sum v^1\right] + (1-\alpha)\Omega^{-1}\left[\omega^l - \sum v^l \ \omega^l\right]$$

However $$\left[\sum v^l \ = 1\right]$$

Thus $$x^l - e = \Omega^{-1}(\mu - r\underline{1})[\alpha - \alpha] + (1-\alpha)\Omega^{-1}\left[\omega^l - \sum v^l \ \omega^l\right]$$

$$x^l - e = (1-\alpha)\Omega^{-1}\left[\omega^l - \sum v^l \ \omega^l\right]$$

$$x^l - e/(1-\alpha) = \Omega^{-1}\left[\omega^l - \sum v^l \ \omega^l\right]$$

Global Competitiveness and Economic Growth: Empirical Verification for African Countries

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Abstract

The target of this work consists of analyzing economic growth in African countries. We have three main results that were generated from this work. First, the pillars of global competitiveness are strongly inspired by the theories of endogenous growth. Secondly, concerning economic growth, African countries realized some impressive performances during the last decade and show very important potential. Finally, by means of panel data evaluation for a sample of 23 African countries during the period (2004-2009), we confirmed the positive and statistically significant effect of economic growth, driven by the level of the global competitiveness.

Keywords: global competitiveness, pillars for competitiveness, panel data, endogenous growth, African countries

JEL Classification: C23, O40, O55

1. Introduction

A few years ago, the international institutions (particularly the World Bank and the International Monetary Fund) and international economic and financial consultant (Goldman Sachs, McKinsey & Company and other) mentioned African countries in their reports. In other words, the economic evolution of the African countries is interested by the whole world.

"The potential of Africa is vast. While the African economies as a group are unlikely to challenge the BRICs (Note) (…), they could deliver significant growth and higher incomes over the next several decades" (Note 2)

In this way, these organizations spoke of the economic growth dimension realized in the African continent. They also spoke of the existing potential of the continent concerning natural resources and other factors of economic growth. Moreover, these organizations analyzed in detail exogenous and endogenous factors, that brought about such performances. Indeed, they estimate that the improvement of the competitiveness of the African countries during the last decade played a big role in the realization of such results.

The aim of our work consists of evaluating empirically the effect of global competitiveness on the economic growth of a group of African countries. To treat such an issue, we will organize our work in three sections. The object of the first section is to search for the link between the pillars of the global competitiveness, used by the World Economic Forum, and the main models of endogenous growth, that represent the modern theory of economic growth. The second section presents the impressive performances of the African countries in terms of realization of their existing capacities. The last section is devoted to our empiric verification of effects of global competitiveness level on economic growth in the case of a sample of African countries.

2. The Assessment of the Global Competitiveness: A Strong Inspiration of the Endogenous Growth Models

The World Economic Forum, in its different reports of assessment of global competitiveness, used twelve pillars for competitiveness divided into three groups. The first group is related to the basic parameters: institutions, infrastructures, macroeconomic stability, health and primary education. The second group represents the sources of efficiency: efficiency of health and primary education, efficiency of the markets and products, efficiency of the labor markets, sophistication of the financial markets, opening to technology and size of the market. The third group concerns the sources of efficiency: sophistication of the enterprises and innovation.

In reality, the majority of these different pillars of competitiveness represent, explicitly or implicitly, the factors of endogenous growth. Thus, Romer (1986) supposed that physical capital is a source of endogenous growth.

Therefore, as the accumulation of the physical capital and the production increase, there is a stock of knowledge that is going to be accumulated and that is going to exercise positive externalities on the activities of the other firms. Implicitly, several institutions can encourage the accumulation of this factor by some means (Note 3) Lucas (1988) also developed an endogenous growth model centered on the human capital, which accumulated by the means of some activities of which the most significant were education, training, health and the innovation. In the same way, Romer (1990) and Aghion and Howitt (1992) developed two models of endogenous growth where the source of growth is in technological innovation (Note 4). Barro (1990) also proposed a model that clarifies the role of infrastructures in the generation of economic growth by the effects of practice that they exercise on the productivity of the private factors (Note 5). In 1993, Pagano also analyzed theoretically the role of financial development in the efficient allocation of financial resources and therefore in economic growth. Finally, Grossman and Helpman (1991) proposed a model where economic growth depends on the opening-up of the economy. This opening encourages technological transfers and opens new foreign markets.

Generally, the majority of the pillars of global competitiveness used by the World Economic Forum in its different assessments are inspired by endogenous growth models developed since the middle of the eighties of the last century (table 1).

Table 1. The inspiration for the pillars of global competitiveness from the models of endogenous growth

Pillar of competitiveness	Pillar 1	Pillar 2	Pillar 3
Endogenous growth model inspiration	Romer (1986): institutions Barro (1990): infrastructures Lucas (1988): health and primary education	Lucas (1988): health and primary education Pagano (1993): sophistication of financial markets Grossman et Helpman (1991): opening to the technology and size of the market	Romer (1990) et Aghion et Howitt (1992): sophistication of firms and innovation

Source: conception of authors

In this table, we insist only on the explicit inspiration. Other implicit inspirations can be evoked. For instance, institutions have implicitly an important role in the accumulation of human capital, technological innovation, financial development and the opening-up of the economy.

3. Economic Growth in African Countries: The Principal Results of the Report of McKinsey Global Institute (Note 6)

In this section, we are going to describe the findings about economic growth in African countries. We will be interested as well by the achieved performances and of the existing potential. Our reference will be the report "Lions on the Move: the Progress and Potential of Africa Economies" published in 2010 by McKinsey Global Institute.

Concerning economic performances, the African countries achieved a great improvement during the last decade. Thus, the African GDP registered 4.9% like on average yearly growth during the period 2000-2008. This rate has more doubled from the one of the years 1980 and 1990. African GDP reached in 2008 1.600 billion dollars; nearly the equivalent of that of Brazil and Russia. Nevertheless, the expenditures of consumption in 2008 are estimated at 860 billion dollars. Finally, after a constant decrease during the eighties and nineties, labor productivity in Africa returned to increase with a strong average yearly growth of 3% during the period 2000-2008. The boom in raw materials prices contributed directly to the rate of 24% in the economic growth of the African countries during the period 2000-2008. This rate can reach 32% if we also consider the indirect contributions.

Actually, in addition to the increase in raw materials prices, there were other factors that played a great role in the realization of these performances. These factors improved African countries global competitiveness.

“The key reasons behind Africa’s growth surge include government moves to end armed conflicts, improve macroeconomic conditions, and adopt microeconomic reforms to create a better business climate. In every country where these shifts occurred, they correlated with faster GDP growth” (Note 7).

For most African countries, political stability is improved by the reduction of the levels of conflict. Several macroeconomic and microeconomic reforms were adopted: privatization of the public corporations, reduction of trade barriers, tax relief on the profit of companies and reinforcement of the legal systems and regulation. Concerning macroeconomic stability, between 1990 and 2000, the rate of inflation declined from 22% to 8% (Note

8), the proportion of public debt in the GDP fell from 81.9% to 59% (Note 9) and the part of the budget deficit in the GDP also declined from -4.6% to -1,8% (Note 10).

This macroeconomic and political stability, combined with these economic reforms have improved the level of African countries competitiveness by the creation of the economics of scale in several sectors, especially the commercial sector.

In addition to the performances already achieved concerning economic growth, Africa possesses a great potential for future economic growth.

"If recent trends continue, Africa will play an increasing important role in the global economy. By 2040, the continent will be home to one in five of the planet's young people, and the size of its labor force will top China's. Companies already operating in Africa should consider expanding (Note 11)".

Thus, African GDP in 2020 is estimated at 2.6 trillion dollar. In the same way, the spending of consumption in Africa is also estimated at 1.4 trillion dollars in 2020. These estimates are based on a number of factors. First, concerning resources, Africa has important world reserves: 10% in oil, 40% in gold, 80% in chrome and 90% in the platinum metals. Secondly, concerning social and demographic changes, the rate of urbanization is estimated to reach 50% in 2030. Finally, Africa is the youngest continent on the planet and the number of workers in Africa is estimated to reach 1.1 billion in 2040.

In reality, the net amelioration of the African countries concerning global competitiveness explains these achieved performances and the potential estimates of the African countries concerning economic growth. To explain the relationship between these aggregates, we use a longitudinal estimate (graphic below).

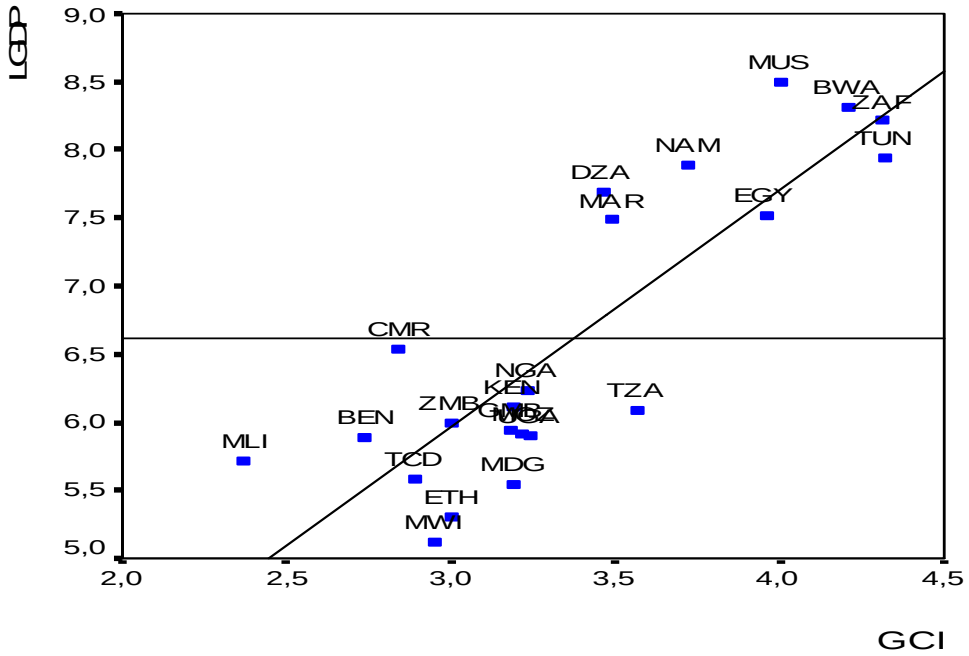

Figure1. The relationship between GDP per capita and GCI

This diagram highlights the positive relation that exists between the two studied variables; the GDP per capita (LGDP) and the Global Competitiveness Index (GCI). In the year of our study (2009) (Note 12), it appears that the obtained results present the interest to analyze a large sample of countries with different levels of development (in the African continent). The countries in the top and on the right of the diagram are the more developed and they have high-levels of competitiveness. On the other hand, the countries in the bottom and on the left represent the less developed and they have the weakest GCI. These results attest to a positive relationship between global competitiveness and economic development level that is going to be the subject of empiric verification in the following section.

4. Global Competitiveness and Economic Growth: An Empirical Verification for A Sample of African Countries

In this section, we are going to study empirically the effects of global competitiveness on economic growth for a sample of African countries (Note 13). To attain such a target, we will follow the approach of Mankiw, Romer & Weil (1992) and Demetriades & Law (2004).

We retain the Cobb-Douglas production function:

$$Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta} \tag{1}$$

with, $L_t = L_o e^{n_t}$ et $A_t = A_0 e^{g_t + \rho_t \theta}$

where, Y is the real output, K is the stock of physical capital, H is the stock of human capital, L is the labor, A is the factor reflecting the level of technology and the efficiency in the economy, n is the rate of the labor force growth, g is the rate of technological progress supposed constant, ρ is the vector representing the global competitiveness and other factors that can affect the level of technology and efficiency in the economy, θ is the vector of coefficients related to these variables, the subscript t indicates time. It is assumed that $\alpha + \beta < 1$.

The evolution of the economy is represented by:

$$\dot{K}_t = \frac{dK_t}{d_t} = s_k Y_t - \delta K_t \quad \& \quad \dot{H}_t = \frac{dH_t}{d_t} = s_h Y_t - \delta H_t \tag{2}$$

Where, s_k and s_h are respectively the rate of investment in physical capital and the rate of investment in human capital.

We suppose that: $\dot{K}_t = I_t - \delta K_t$ and $I_t = S_t$

Where, δ is the rate of the physical capital depreciation.

We consider that the production by unit of labor, the physical capital stock by unit of labor and the human capital stock by unit of labor are given by:

$$y_t = \frac{Y_t}{AL_t}; \qquad k_t = \frac{K_t}{AL_t} \qquad \text{and} \qquad h_t = \frac{H_t}{AL_t}$$

After all developments, we obtain:

$$\dot{k_t} = s_k y_t - (n + g + \delta) k_t \tag{3}$$

$$\dot{h_t} = s_h y_t - (n + g + \delta) \tag{4}$$

We consider that the gross domestic product per effective worker is written as follows:

$$y_t = \frac{Y_t}{AL_t} = k_t^{\alpha} h_t^{\beta} \tag{5}$$

The substitution of (5) in (3) and in (4), produces:

$$\dot{k_t} = s_k k_t^{\alpha} h_t^{\beta} - (n + g + \delta) k_t \tag{6}$$

$$\dot{h_t} = s_h k_t^{\alpha} h_t^{\beta} - (n + g + \delta) h_t \tag{7}$$

At the equilibrium, we have: $\dot{k_t} = \dot{h_t} = 0$

This result conducts us to the following relations:

$$s_k k_t^{\alpha} h_t^{\beta} = (n + g + \delta) k_t \tag{8}$$

$$s_h k_t^{\alpha} h_t^{\beta} = (n + g + \delta) h_t \tag{9}$$

On dividing (8) by (9), we obtain:

$$h = \frac{s_h}{s_h} k \tag{10}$$

The substitution of (10) in (9) and (8), shows us to the following relation:

$$k^* = \left(\frac{s_k^{1-\beta} s_h^{\beta}}{n+g+\delta} \right)^{\frac{1}{1-\alpha-\beta}} \tag{11}$$

$$h^* = \left(\frac{s_k^{\alpha} s_h^{1-\alpha}}{n+g+\delta} \right)^{\frac{1}{1-\alpha-\beta}} \tag{12}$$

The relations (11) and (12) reveal the steady state of the economy.

While taking into account the relation (5), we will have:

$$\left(\frac{Y}{AL}\right)^{*} = (k^{*})^{\alpha}(h^{*})^{\beta}$$

It means that:

$$\left(\frac{Y}{L}\right)^{*} = (y)^{*} = A^{*}(k^{*})^{\alpha}(h^{*})^{\beta} \quad (13)$$

The relation (13) represents the output by worker to the equilibrium.

At the equilibrium, the technological progress is represented by:

$$A^{*} = A_0 e^{\rho\theta} \quad (14)$$

Where, ρ represents the variables that correspond to the factors that can influence the technological progress. In our study, ρ regroups the variables reflecting the global competitiveness.

The substitution of (11), (12) and (14) in (13), produces:

$$(y)^{*} = A_0 e^{\rho^{*}\theta}\left(\frac{s_k^{1-\beta}s_h^{\beta}}{n+g+\delta}\right)^{\frac{\alpha}{1-\alpha-\beta}}\left(\frac{s_k^{\alpha}s_h^{1-\alpha}}{n+g+\delta}\right)^{\frac{\beta}{1-\alpha-\beta}} \quad (15)$$

To have a linear relation, we apply the logarithm:

$$Ln(y)^{*} = Ln\left[A_0 e^{\rho^{*}\theta}\left(\frac{s_k^{1-\beta}s_h^{\beta}}{n+g+\delta}\right)^{\frac{\alpha}{1-\alpha-\beta}}\left(\frac{s_k^{\alpha}s_h^{1-\alpha}}{n+g+\delta}\right)^{\frac{\beta}{1-\alpha-\beta}}\right] \quad (16)$$

If we add the subscript of the time and the individual, we can write the following relation:

$$Ln(y_{it})^{*} = Ln(A_{0i}) + \theta_i\rho_{it} + \frac{\alpha}{1-\alpha-\beta}Ln(s_{k_{it}}) + \frac{\beta}{1-\alpha-\beta}Ln(s_{h_{it}}) - \frac{\alpha+\beta}{1-\alpha-\beta}Ln(n_{it}+g+\delta) \quad (17)$$

where, g and δ are supposed constant for all the countries and in the time and their sum is equal to 0.05 (Mankiw and al., 1992). The variable $Ln(A_{0i})$ involves the structural factors and the factors of the economic environment possessing an influence on the economic growth. In our case, we took into consideration the factors of economic policies, to know the level of inflation and government expenditures.

Therefore, our regression is based on the following relation:

$$LGDP_{it} = \alpha + \beta \mathrm{GCI}_{\mathrm{it}} + \gamma LINVEST_{it} + \lambda LEDU_{it} + \tau LG_{it} + \mu LINF_{it} + \varepsilon_{it} \quad (18)$$

where, "i" indicates the countries (i = 1, 2,..., N) and "t" represents the time (t = 1,…, T), *LGDP*: the logarithm of the GDP per capita calculated in constant dollars of 2000; *GCI*: the Global Competitiveness Index; *LINVEST*: the logarithm of the average yearly ratio of the investment in relation to the GDP; *LEDU*: the logarithm of the secondary schooling rate; *LG*: the logarithm of the ratio of the public expenditures in relation to the GDP, *LINF*,: the logarithm of the inflation ratio (+ 1) calculated according to the consumer prices index and ε_{it}: is the error term.

All these variables are extracted from the yearly data of the World Bank data base (WDI), except for the data concerning the Global Competitiveness index which are extracted from "the Global Competitiveness Report", published by the World Economic Forum.

We estimated econometrically the last equation with the method of panel data for a sample of 23 African countries (Note 14) during the period 2004-2009.

The econometric analysis in panel data renders an account, both individual and temporal dimensions of the observations. A high number of observations permit us to take account of the individual differences of performances that is due to the influence of other factors that are considered in the regression.

The wealth of information in the estimation by panel data models lead to the following consequence: an important observed number of individuals allow great precision of the estimates.

While we estimate a sample with panel data, the first thing that it suitable to verify, is the homogeneous or heterogeneous specification of the generating process of the data. After that, we apply the individual-specific test to determine if we can suppose that the studied model is perfectly identical for all countries or each country have some specificities.

The presence of individual-specific effect makes the estimators of the Ordinary Least Square (OLS) not efficient. In these conditions, we must assess the estimation by the "within" method if these effects are fixed or by the Generalized Least Squares (GLS) method if these effects are random.

The application of the individual specification test rejects the homogeneity hypothesis of the variables.

When the heterogeneity of the variables is detected, we must choose between either regression by "within" method or by the (GLS) method. To substitute between these two methods, we apply the Hausman (1978) specification test. Referring to the statistic of this test, we must use the "within" method to estimate the model with fixed effects which is convergent and efficient.

The principal results of the GDP per capita regression according to its determinants are recapitulated in table 2.

Table 2. The results of the econometric regression (referring to the equation 18)

Endogenous variable is LGDP

GCI	LINVEST	LEDU	LPUBE	LINF	C	N	R^2	Hausman
0.107*	0.074**	0.172*	-0.082*	-0.035*	5.511*	133	0.997	50.251*

* Significant at 1%; ** Significant at 5%; *** Significant at 10%.

The results of our estimation confirm that the level of global competitiveness, measured by the Global Competitiveness index (GCI) exercises a positive and statistically significant effect on the level of the GDP per capita in our sample constituted by a whole raft of African countries. The result can explain and justify the contribution of the evolution of global competitiveness level of the African countries during the last years of their economic growth. An evolution that is due to a number of economic reforms (Note 15) and to the political stability that characterized these countries. Thus, the fruits of these reforms are justified by the positive effect of the physical capital and human capital accumulation on economic growth.

The effect exercised by the global competitiveness of the economies, confirmed by our econometric regression, can also contribute to the potential transformation of the continent in concrete results in the next years. The African countries achieved great performances regarding economic growth, but the most important issue is on the one hand the achievement of continuity, and on the other hand, the development of the endogenous factors of wealth creation. These factors can operate on the competitiveness of their economies.

5. Conclusion

In this work we have tried to study the question of the economic growth in a sample of African countries and we came to a number of results. First, we showed how, in its evaluation of the global competitiveness of the different economies, the World Economic Forum take inspiration from the modern theories of economic growth (endogenous growth). Secondly, we presented the achievements during the last decade and the existing potential of the African continent concerning economic growth. Finally, by the means of panel data estimates for a sample of African countries during the period (2004-2009), we attempted to verify the contribution of the improvement of global competitiveness of these economies in their realization of increased economic growth.

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Notes

Note 1. Brazil, Russia, India and China

Note 2. O'Neill and Stupnytska (2010).

Note 3. The government can encourage the accumulation of this factor by decreasing its utilization cost, by the means of the subsidy instruments.

Note 4. This consists in producing new capital goods from a number of ideas resulting from the Searches & Development activity.

Note 5. Private labor and physical capital.

Note 6. It is an institute of research of the McKinsey group that represents one of the principal international groups of economic and financial consultation.

Note 7. McKinsey & Company (2010).

Note 8. Either a fall of 64%.

Note 9. Either a decrease of 28%.

Note 10. Either an amelioration of 60%.

Note 11. McKinsey & Company (2010).

Note 12. The use of (2009) like a year of our longitudinal estimates refers to the ending year in our empirical study, in the next paragraph.

Note 13. The choice of the countries of our sample is fixed by the availability of the data.

Note 14. Our sample is composed by these countries: South Africa, Botswana, Mauritius, Namibia, Gambia, Kenya Nigeria, Tanzania, Benin, Uganda, Cameroon, Zambia, Ethiopia, Malawi, Madagascar, Mozambique, Mali, Chad, Tunisia, Egypt., Morocco, Algeria and Zimbabwe.

Note 15. Privatization of the public companies, reduction of trade barrier, tax relief and consolidation of the legal systems.

Examining International Parity Relations between Kenya and Uganda: A Cointegrated Vector Autoregressive Approach

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Abstract

This paper analyses empirically the purchasing power parity, the uncovered interest parity and the real interest parity (Fisher parity) between Kenya and Uganda. The paper first tests the three parity relations using stationarity tests. Afterwards the study jointly models international parity conditions, namely PPP, RIP and UIP using a Cointegrated Vector Autoregressive approach. From the analysis of the individual parities, there is no evidence that the individual parities hold between the two countries except for RIP. On the other hand the joint VAR model establishes that the Kenya-Uganda inflation rates, interest rates, and the real exchange rate have followed a long-run equilibrium-correcting behavior. The joint Cointegrated VAR analysis reveals that all the endogenous variables explain more than 99.95% of the VAR model. This indicates a fast correction towards the long run equilibrium of the parity relations. Hence when the three parity relations are jointly modeled, it can be argued that Uganda has shown a tendency to converge to Kenya both in both nominal and real terms.

Keywords: purchasing power parity, uncovered interest parity, real interest parity, common currency, cointegrated var, East African community

1. Introduction

The ratification of the East African Community (EAC): the regional intergovernmental organization of the Republics of Kenya, Uganda, Tanzania, Rwanda and Burundi, calls for a close examination of the five countries' economic policy decisions that affect the level and stability of prices, long-term interest rates, the fiscal position and the nominal exchange rates.

The EAC aims at widening and deepening co-operation among the partner States in, among others, political, economic and social fields for their mutual benefit. To this end the EAC countries established a Customs Union in 2005, a Common Market in 2010, and are working towards a Monetary Union by 2012 and ultimately a Political Federation. This co-operation among the EAC countries is expected to open up numerous investment and trade opportunities to the member states and individual investors.

The EAC common market protocol creates a free market of more than 130 million people with a combined GDP of about US$ 72 billion. Within the EAC, Kenya has the strongest economy contributing close to more than 40 percent of EAC's total GDP. Tanzania, Uganda, and Rwanda have very similar income levels of some US$ 500 per capita, about two thirds of Kenya's income levels. Overall, the EAC region has been a dynamic economic area averaging an annual GDP growth rate of five percent over the last five years.

The question however that arises is whether the EAC economies are ready for the common monetary policy. This in turn raises a number of research questions. For instance (1) do the real GDP per capita, external debt, consumer price index, interest rates for the five East African Community countries move together? (2) to what extent do the EAC countries' GDP respond to shocks arising from the other East African Community Member countries real GDP per capita, external debt, consumer price index and interest rates? (3) to what extent do the EAC countries' real GDP per-capita respond to shocks arising from the external world as captured through the exchange rate against the US dollar? (4) is the level of integration among the five EAC countries as depicted through the responses in (1), (2) and (3) above sufficient to support a common currency area?

This issue has usually been analyzed from the point of view of the optimum currency area theory (Mundell, 1961, McKinnon, 1963, and Kenen, 1969) which weighs the benefits of a monetary union against its costs. A number of empirical studies in this area concentrate on the symmetry of shocks and shock transmission mechanisms in a given country and its potential partners in the monetary union (De Grauwe, 2003).

Many studies have examined the validity of both the absolute and relative versions of PPP. While there is a large coincidence on the fact that absolute PPP is almost always rejected, the evidence on relative PPP is mixed (Sosvilla-Rivero & Garcia, 2003). Eiteman, Stonehill and Moffet (2007) gave two general conclusions that can be gathered from studies on PPP. Firstly, PPP holds up well over the very long run but poorly for shorter time periods and secondly, the theory holds better for countries with relatively high rates of inflation and underdeveloped capital markets. However, whether or not such a relationship holds in the long run, it has also not been without controversy in the literature (Cheng, 1999). In addition, there are some studies that used data from developed countries with relatively low rates of inflation but still found strong support for PPP, for example Sarno and Valente (2006) found evidence of PPP for G5 countries and Alba and Papell (2007) for some European countries. These mixed conclusions of previous studies have given impetus for more studies to be conducted on the international parity conditions.

On the basis that Kenya and Uganda are the largest contributors to the EAC GDP, this paper sought to analyze whether Kenya and Uganda have achieved a sufficient degree of convergence. The paper applied a joint modeling of the three parity relations, the purchasing power parity (PPP), the uncovered interest parity (UIP) and the real interest parity (UIP), an approach which is similar to that of Juselius and MacDonald (2004a), who scrutinized the parity relations between Germany and the US and also adopted by Stazka (2008) in his study of the parity conditions between Germany and Poland.

The study covers macroeconomic variables for Kenya and Uganda for a period of fifty years between 1961 and 2010. The macroeconomic variables covered by the study included real GDP per-capita, external borrowing, the spot exchange rate (defined as local currency/US$), the foreign country CPI, the foreign country lending rate, for the two countries.

The remainder of this paper is organized as follows: Section 2 covers the literature review; Section 3 covers the methodology and the result of empirical analysis and Section 4 includes the discussion of findings, conclusion and recommendation.

2. Literature Review

2.1 International Parity Relations

The core of international finance theory lies in international parity conditions. International parity relations detail how exchange rates, interest rates and inflation rates are linked in the market. These relationships can be summarized as follows: the first is purchasing power parity (PPP), or the hypothesis that there exists a constant long-run equilibrium real exchange rate; the second is the Fisher Effect (FE), which tests the relationship between difference in inflation rates and difference in nominal interest rates and the third, the International Fisher Effect (IFE), establishes a relationship between real exchange rates and real interest rate differentials. The three parity relations between two economies hold if goods and asset markets of these economies are perfectly integrated, that is when goods and capital are perfectly mobile. If this is the case, the economies in question can form a common currency area without fearing serious turbulence in case of asymmetric shocks.

Covered interest parity is the mechanism through which an equilibrium relationship is established between spot and forward exchange rates, and risk-equivalent domestic and foreign nominal interest rates. This relationship is also sometimes referred to as the interest rate parity theorem or the covered interest arbitrage condition. Empirical tests generally show that the forward rate is not a very good predictor of the level of the future spot rate (it explains about 10% of the change in the actual future exchange rates). However, evidence is strong that the forward rate does a better job of predicting at least the direction of changes in future spot rates than do about two-thirds of the better known foreign exchange forecasting services, making it one of the better predictors around.

The economic rationale behind the three parities is given by arbitrage on goods and asset markets. Specifically, if goods are perfectly mobile across countries, then arbitrage ensures that their prices – after accounting for expected changes in the value of the various currencies – are ultimately equalized, which is reflected in the PPP condition. Further, if capital is perfectly mobile across countries, then arbitrage ensures that yields on assets of these countries – again after accounting for expected changes in the value of their respective currencies – are also equalized, which is reflected in the UIP. It can be shown that the PPP and the UIP, taken together, imply the RIP (Lambelet & Mihailov, 2005); in other words, arbitrage on goods and asset markets ultimately leads to an equalisation of real returns on assets. An implication that the three parities hold is, thus, that the goods and asset markets of two economies are to a large extent integrated.

This, in turn, means that these economies can share a currency and a common monetary policy without fearing serious turbulence when large asymmetric shocks occur. Indeed, the probability of such shocks is very low, because

economies whose markets are integrated also share a common business cycle and usually have similar output structures (Mongelli, 2005).

2.2 Previous Studies on International Parity Relations

There exists a lot of empirical literature on the parity conditions being analyzed though in most studies each of the parity conditions is analyzed separately, whereas in this paper they are modeled jointly. This joint modeling approach is originally due to Juselius and MacDonald (2004a), who scrutinized the parity relations between Germany and the US. A similar approach was taken by Stazka (2008), who scrutinized parity relations between Germany and Poland. Essentially, the analysis in this paper is an application of their approach to the Kenya and Uganda scenario.

Stazka's analysis did not find any evidence that the parities, or any linear combinations of them, held for their data set. They identified two long-run equilibrium relations: (1) the relation imposing a long-run homogeneity restriction on the domestic and foreign inflation and the domestic interest rate and (2) the relation that brings together the domestic real interest rate and the foreign inflation. Juselius and MacDonald (2003) found out that the joint modeling of international parity conditions, namely Purchasing Power Parity (PPP) and the Uncovered Interest Parity (UIP), produces stationary relations showing an important interaction between the goods and the capital markets. Franco (2006) found results consistent with those of Juselius and MacDonald (2003).

Frankel (1993) discusses the relationship between the different theories and assumptions, while Meese and Rogoff (1988) probably provides the classic derivation of the relationship between real exchange rates and real interest rates investigated here.

Despite the theoretical and intuitive appeal both of the real exchange rate real-interest rate differential relationship and of its underlying components, the empirical evidence for these propositions (either separately or collectively) has at best been mixed. The American Graduate School of International Management "Thunderbird" (2003) states that there is also an effective exchange rate, which is a multilateral rate that measures the overall nominal value of the currency in the foreign exchange market.

The relationship between exchange rates and nominal interest rates is captured in two propositions: one the covered interest parity theorem (CIP) which deals with a no-arbitrage equilibrium in international financial markets, and the speculative efficiency hypothesis and the resulting uncovered parity theorem (UIP) which deals with a speculative equilibrium in international financial markets.

The three parities have been analysed very extensively using various methods; theoretical and empirical studies in this field are discussed at length in the meta-studies of MacDonald (1998) and Sarno (2002). The general upshot of this literature is that the parities, taken alone, seldom hold empirically in typical data samples. Only for very long time series, spanning a century or so, or for panel data of large dimensions can the parities be empirically verified.

As mentioned in Section 1, the empirical methodology in this paper follows the approach put forward by Juselius and MacDonald (2004a), who jointly scrutinize the international parity relations between Germany and the USA. Their analysis strongly rejects the stationarity of single parities, but by allowing the latter to be interrelated it recovers their stationarity. The authors also argue that the apparent nonstationarity of the simple parities is due to very slow adjustment to sustainable exchange rates.

The approach of Juselius and MacDonald is based on earlier work by Juselius (1990, 1992, & 1995), Johansen and Juselius (1992), and MacDonald and Marsh (1997), and it was also applied to Japan vs. the USA by Juselius and MacDonald (2004b). Another important exception to the rule that empirical research in this area concentrates on only one of the parities is a recent paper by Lambelet and Mihailov (2005), who also model the three parities jointly using various single equation and system equation estimation methods. The authors refer to the parities as the triple parity law, stressing that they are closely interrelated. Robust evidence is found that the parities hold in the long run, on average, and ex post.

3. Methodology and Model Specification

The study used macroeconomic data including real GDP per-capita, external borrowing, the spot exchange rate (defined as local currency/US$), the foreign country CPI, the foreign country lending rate, for the two countries covering a period of fifty years between 1961 and 2010.

The study employed Augmented Dickey Fuller (ADF) tests to test for stationarity of the three parity relations between the two countries. The Vector Autoregressive (VAR) model was estimated through which the three parity conditions were jointly modeled for joint cointegration analysis. The VAR model is preferred because it provides a systematic way to capture the presence of rich dynamics in multiple time series.

3.1 Model Specification for Stationarity Tests

The model used in this study was adopted from (Stazka, 2008). First the Purchasing Power Parity (PPP) is tested. PPP is one of the most extensively studied relationships in the international economics. In its strong form it can be written as follows:

$$PPP_t = P_t + P_t^* - S_t \quad (1)$$

Where PPP_t is the deviation from PPP, P_t and P_t^* are, respectively, the domestic and the foreign price levels, and S_t is the spot exchange rate (in price notation, i.e. the price of foreign currency in units of domestic currency). Empirically, the PPP condition is verified if PPP_t is a stationary process.

Next the uncovered interest parity (UIP) relationship is examined:

$$E_t(\Delta S_{t+m}) = I_{tm} - I_{tm*} \quad (2)$$

Where E_t denotes the expected value given the information set available at time t, Δ is the difference operator and I_{tm} and I_{tm*} are, respectively, the domestic and the foreign nominal treasury bills with maturity, m. Thus, the UIP postulates that the expected rate of denomination of the domestic currency should be equal to the home vs. foreign interest spread. Assuming rational expectations:

$$\Delta S_{t+m} = E_t(\Delta S_{t+m}) + \varepsilon_{t+m} \quad (3)$$

Where ε_{t+m} is the error term

Combining (2) and (3) leads to:

$$\Delta S_{t+m} - (I_{tm} - I_{tm*}) = \varepsilon_{t+m} \quad (4)$$

Under the assumption of rational expectations, testing the UIP amounts to testing whether ε_{t+m} in (4) above is stationary.

The third parity relation of interest is the real interest parity (RIP):

$$R_{tm} = R_{tm*} \quad (5)$$

In its testable version:

$$R_{tm} - R_{tm*} = V_{tm} \quad (6)$$

Where R_t and R_{tm*} are the domestic and the foreign real treasury bills with maturity, m, respectively.

If the RIP holds, then V_{tm} in (6), which is the empirically observed real interest differential between the home and foreign country, should be a stationary process.

A useful relation in international parity relations is the Fisher decomposition stating that the nominal interest yield is the sum of the real yield and the expected inflation rate over a given period (t to $t + m$):

Using the Fisher decomposition, equation (6) can be rewritten in the following way:

$$I_{tm} - I_{tm*} = E_t(\Delta P_{t+m} - \Delta P_{t+m*}) + V_t \quad (7)$$

Again assuming rational expectations:

$$(I_{tm} - I_{tm*}) - (\Delta P_{t+m} - \Delta P_{t+m*}) = V_t \quad (8)$$

From equation (8) above the RIP holds empirically if the difference between the interest rate spread and the inflation differential is stationary.

3.2 Cointegrated VAR Model Specification

Following Juselius & Macdonald (2003, 2005) the j-dimensional cointegrated VAR (k) model is given by the following equation:

$$\Delta X_t = \Pi X_{t-1} + \Gamma_1 \Delta X_{t+1} + \ldots + \Gamma_{k-1} + \Delta X_{t-k+1} + \Phi D_t + \varepsilon_t \quad (9)$$

where X_t is a $jx1$ vector of endogenous variables, D_t is a $bx1$ vector of deterministic components (such as a constant, a linear time trend, seasonal or intervention dummies, or strictly exogenous variables), ε_t is a vector of error terms, and Π, Γ_i and Φ are coefficient matrices of appropriate dimension. Based on the assumption that all variables in (9) are at most I (1), the cointegration hypothesis can be formulated as a reduced rank restriction on the matrix Π:

$$\Pi = \alpha\beta \quad (10)$$

Where α and β are k coefficient matrices with full column rank and r x j, which implies that the rank of Π is also r. As the variables in X_t are I (1), their first differences on the left hand side of (10) are stationary; therefore, all terms on the right hand side of the equation must also be stationary. Thus, the matrix Π translates the non-stationary vector

t X_{t-1}, into a stationary one ΠX_{t-1}. More precisely, it is the expression β X_{t-1} that defines the stationary linear combinations (cointegration relations) of the I (1) vector $X_{t-1,}$ whereas the matrix α describes how the variables in the system adjust to the equilibrium error from the previous period β X_{t-1}. The rank r of the matrix Π gives the number of cointegration relations (steady states, long-run equilibrium relations) between the j variables of the VAR system, whereas j-r gives the number of common stochastic trends that drive their behaviour.

The analysis in the next section aims at finding cointegration relations between the variables of interest that can be given a meaningful economic interpretation, and at identifying the common stochastic trends.

The vector of variables that are relevant for this analysis is defined as follows:

$$X_t = [\ P_t \quad P_t^* \quad I_t \quad I_t^* \quad S_t\ ] \tag{11}$$

Where: P_t = the Kenyan ("home country") consumer price index,

P_t^* = the Ugandan ("foreign country") consumer price index,

I_t = the Kenyan 91 day Treasury bill rate,

I_t^* = the Ugandan 91 day Treasury bill rate,

S_t = the spot exchange rate (defined as KES/UGX).

The data are monthly, and span the fifty years period between July 2005 and June 2010. All series are obtained from the Central Bank of Kenya for Kenya series and Bank of Uganda for Uganda series. The data in levels and in differences are depicted in Appendix 3 to Appendix 5 below.

Both the graphical analysis of the time series in the previous section and the formal tests to be discussed in the next section suggest that all the variables are I (1). The transformed vector of variables whose joint behaviour is to be explained within the cointegrated VAR framework now becomes:

$$\Delta X_t = [\Delta P_t \quad \Delta P_t^* \quad \Delta I_t \quad \Delta I_t^* \quad \Delta PPP_t] \qquad \sim I(1) \tag{12}$$

Where PPP_t is the deviation from PPP

The aim is to find out whether there exist stationary linear combinations of the simple parities. In other words, to find parameter values for A, B and C such that:

$$A(\Delta I_t - \Delta I_t^*) - B(\Delta P_t - \Delta P_t^*) - C\ \Delta PPP_t \tag{13}$$

define stationary equilibrium relations which pull the system variables whenever they are pushed away from equilibrium.

3.3 Results of Empirical Analysis

3.3.1 Individual Parity Stationarity Test Results

Based on ADF test, the series for deviation from PPP would be stationary at 1%, 5% or 10% level of significance if the calculated ADF statistic is less than the respective critical values of -3.5713 (for 1% level of significance), -2.5923 (for 5% level of significance) and -2.599 (for 10% level of significance). All the calculated ADF statistics – except the ADF statistic showing RIP between Kenya and Uganda is significant at 5% level of significance. From the analysis, the Purchasing Power Parity and Uncovered Interest Parity relationship does not hold between Kenya and Uganda. Only the real interest parity holds. The results are summarized in Appendix 1 below.

3.3.2 Joint Cointegrated VAR Modeling Results

The joint VAR modeling results suggest that the estimated VAR model satisfies the I (1) assumptions, which postulate that: (1) the rank of the matrix Π is equal to r, (2) the residuals are independent, (3) the sample size is large and (4) the parameters of the VAR model are stable throughout the sample.

The next step of analysis consisted of the determination of the cointegration rank, r, i.e. the number of steady-state relations between the variables of the system. The only formal test applied was the Johansen test, whose results show that the largest two eigenvalues are significantly different from zero at 5% significance level as summarized in Appendix II below.

The Johansen Cointegration test thus points to r =3. Thus, based on the Johansen Cointegration test the rank of the matrix Π and thus the number of steady-state relationships between the variables of interest is concluded to be equal to three. The L.R. test indicates 3 cointegrating equations at 5% significance level. No restrictions were imposed on the VAR model.

The cointegration relations are defined as follows:

$$CR1_t = \Delta P_t + 1.034297\Delta P_t^* - 0.099945\Delta I_t^* - 0.168381\Delta I_t - 0.997899\Delta PPP_t - 0.000411 \quad (14)$$

The log likelihood is 972.6986 whereas all the p-values for the coefficients indicate that the cointegration coefficients in equation (14) above are empirically identified – the coefficients which have not been set to zero are significantly different from zero as depicted by the p-values.

The reactions of the endogenous system variables to the departure from steady-states are plausible in the sense that the respective coefficients are significant, have the signs consistent with error-correcting behaviour and are of magnitude which by and large "makes sense". Based on this and from the economic point of view the cointegration relations indicate the following results: (1) The Ugandan price index (P_t^*) is equilibrium-adjusting, i.e. if there is a positive departure from the above $CR1_t$ equilibrium model then change in the Ugandan price index (ΔP_t^*) would increase in the next month correcting about 103% of the equilibrium error. This is a very fast adjustment as it implies that a 1% increase in the equilibrium model above would result in a 103% increase in the Uganda price index; (2) The above result is however the opposite of the departure from PPP correction. If there is a positive departure from the above $CR1_t$ equilibrium model then change in the international fisher effect between Kenya and Uganda (ΔPPP_t) would fall in the next month correcting about 99.8 % of the equilibrium error; (3) the Ugandan 91 treasury bill rate (I_t^*) is equilibrium-adjusting, i.e. if there is a positive departure from the above $CR1_t$ equilibrium model then change in Ugandan T-bill rate (ΔI_t^*) would fall in the next month correcting about 9.99% of the equilibrium error; and (4) it is interesting to note that the coefficient for dummies is less than 0.05%; meaning that the endogenous variables explain more than 99.95% of the VAR model. This indicates a fast correction towards the long run equilibrium of the parity relations.

4. Conclusion and Recommendations

This paper tried to identify a set of economically meaningful long-run equilibrium relations that would reflect the international parity relations - the purchasing power parity, the uncovered interest parity and the real interest parity - between Kenya and Uganda. As these parities seldom hold empirically, the general idea was to model them jointly in order to uncover the dynamic structure underlying the stochastic behaviour of prices, interest rates and the real exchange rate in Uganda versus Kenya. The empirical analysis, based on individual parity stationarity tests showed that the simple parities are inconsistent with the subject data set except for RIP.

Therefore, the question arises why the parities that are so well-established in the economic theory could not hold when analyzing the Kenya-Uganda data set. The rationale for this is in the fact that the sample was rather short, and covered the periods when both Uganda and Kenya were undergoing significant economic policy changes. Therefore, the parities which are supposed to hold in the long run could not (yet) be identified within the model. One has probably to wait several years (more than the fifty years in the model) before these long-run relations can actually be reflected in the data.

The analysis did establish a VAR model with reasonably stable parameters and remarkably well-behaved residuals, which led to meaningful conclusions about the stochastic behaviour of the variables. Meaningful long-run equilibrium relations that the system was adjusting to were identified: one depicting the interdependence of Kenya's and Uganda's inflation rates and exchange rate, partly the result of inflation expectations, and partly affected by the real exchange rate, and the other bringing together the domestic (Kenya's) real interest rate and the foreign (Uganda's) inflation. All the variables exhibit equilibrium-adjusting behaviour, i.e. they are pulled back to the steady-state once they have been pushed away from it.

Referring to the question asked in the introduction to this paper – whether the EAC is "ripe" for the common monetary policy – the answer is not a clear-cut "NO", despite the empirical failure of the individual parities. As the Kenya-Uganda inflation rates, interest rates, and the real exchange rate have followed a pattern that is consistent with long-run equilibrium-correcting behaviour, and because the estimated system shows such remarkable degree of stability, it can be argued that Uganda has shown a tendency to converge to Kenya both in nominal and in real terms. Therefore, one can conclude that in the long run the Kenyan and Ugandan economies can be integrated without fearing major turbulences.

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Appendix 1. Stationarity (ADF) test results

Kenya	PPP ADF tests	UIP ADF tests	RIP ADF tests
	-0.1418	-1.2763	**-2.2503***
Uganda	(0.8879)	(0.2084)	(0.0294)
	I (1)	I (1)	I (1)

Critical values for rejection of hypothesis of a unit root:

1% -3.5713 5% -2.5923 10% -2.5990

The table shows ADF results. The ADF statistics are shown first in the cells. *ADF statistics for stationary RIP at 5% level of significance is denoted in bold. The order of the series is shown last in the cells. The values in brackets denote the p-values for the ADF test

Appendix 2. Johansen cointegration test results

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.446793	90.80299	68.52	76.07	None **
0.355797	57.64974	47.21	54.46	At most 1 **
0.286944	33.02423	29.68	35.65	At most 2 *
0.188938	14.08529	15.41	20.04	At most 3
0.041238	2.358311	3.76	6.65	At most 4

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

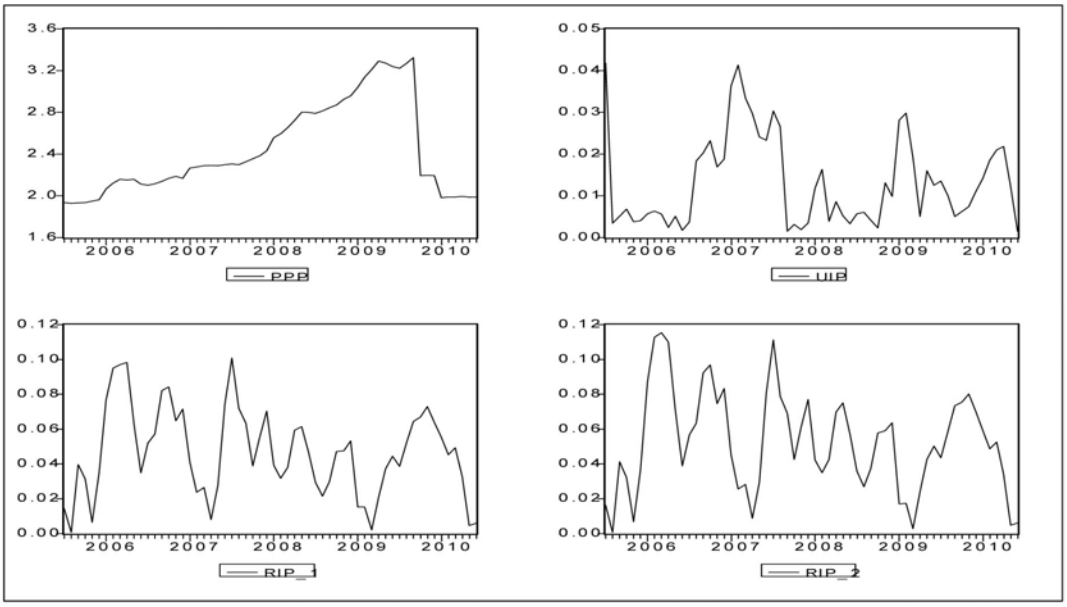
L.R. test indicates 3 cointegrating equation(s) at 5% significance level

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

QCPI_KE	QCPI_UG	QPPT	QTBILLR_KE	QTBILLR_UG	C
1.000000	1.034297	-0.997899	-0.168381	-0.099945	-0.000411
	(0.01952)	(0.00127)	(0.05787)	(0.02436)	
Log likelihood	972.6986				

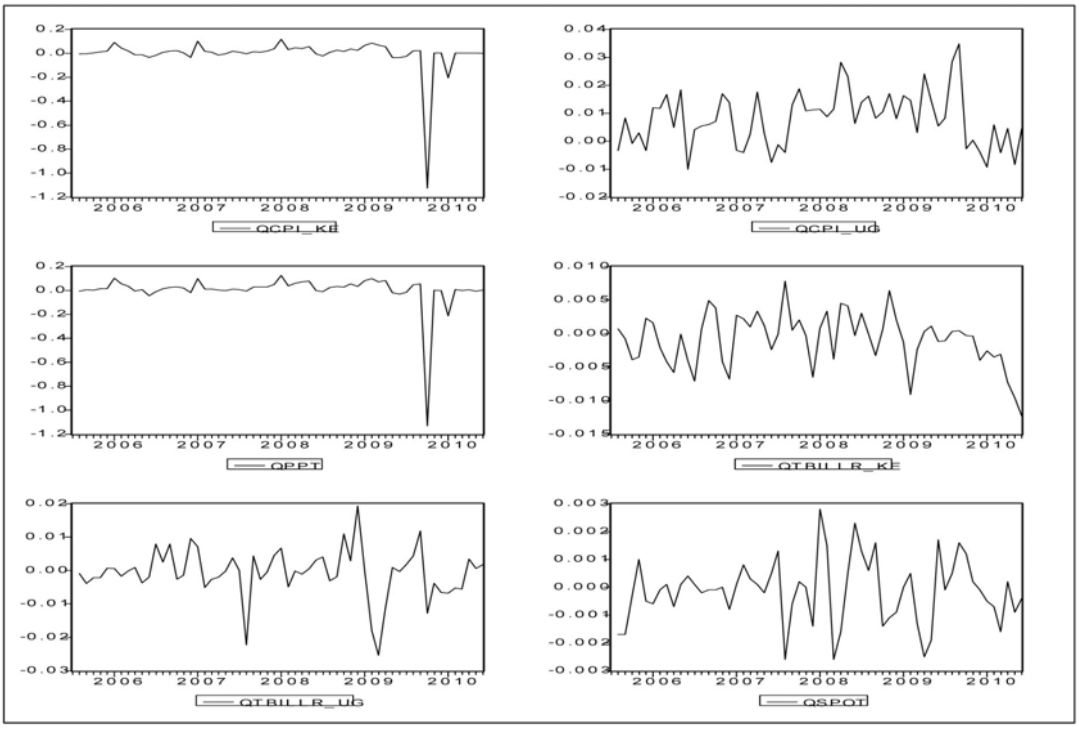
The table shows the Johansen cointegration results

Appendix 3. Data in levels



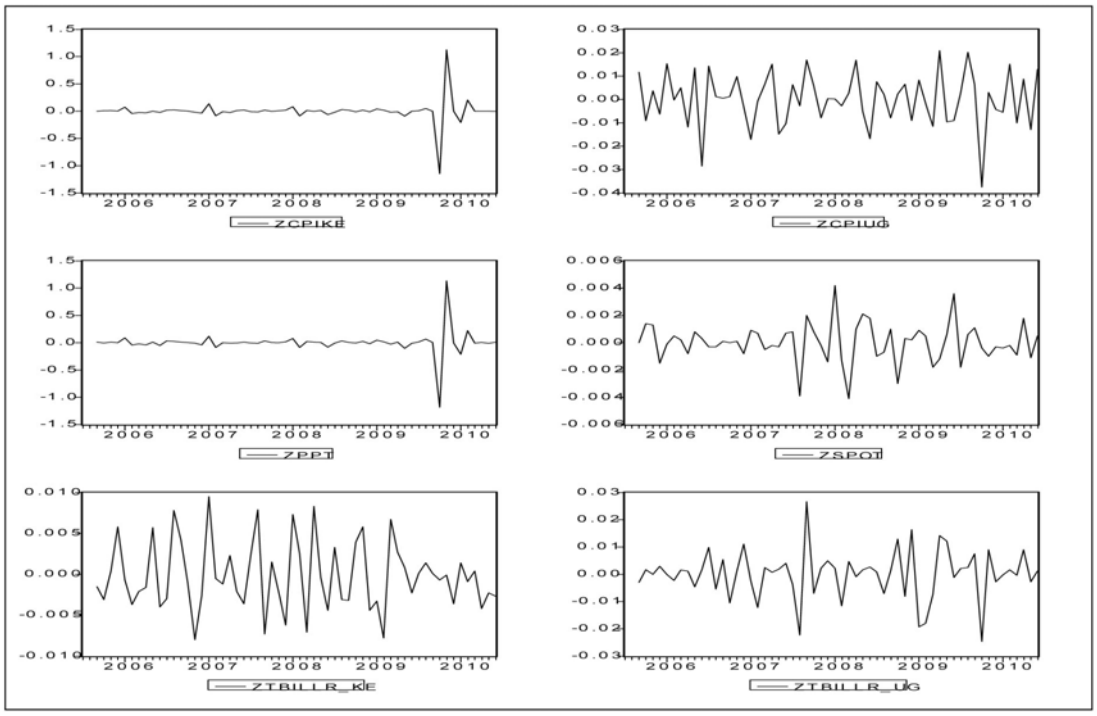
The above figure shows the series for data in levels. PPP, UIP and RIP stands for Purchasing Power Parity, Uncovered Interest Parity and Real Interest Parity

Appendix 4. Data in first difference



The above figure shows the series for data in differenced once for the Kenya and Uganda CPI, T-Bill rates and exchange rates.

Appendix 5. Data in second difference



The above figure shows the series for data in differenced twice for the Kenya and Uganda CPI, T-Bill rates and exchange rates.

The Impact of Institutional Investors on Firms Accounting Flexibility: Evidence from Jordan

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Abstract

In this paper the existence of the impact of the institutional investor on the firm's accounting flexibility in generating discretionary accruals was verified. For this purpose balanced data cross-sectional regression model for all 70th Jordanian manufacturing companies listed at Amman Stock Exchange (*ASE*) over eleven years from *2000 to 2010* was utilized. In the regression model discretionary working capital accruals (*DWCA*), proxy for earnings manipulation, was set as the dependant variable. Independent variables were; the percentage of the institutional investors ownership of common stock in firm as a proxy of the institutional investors (IIP), the managerial ownership (MAO), firm's size (SIZE), leverage ratio (LEV), and return on sales ratio (ROS). The econometric model was estimated. The results of various analysis and tests carried out in this study confirm the monitoring role of the institutional investors and the role played by the institutional investor in alleviating the practices of earnings management.

Keywords: institutional investors, accounting flexibility, Jordan

1. Introduction

This paper seeks to investigate the effect of institutional ownerships on earnings manipulation activities in the Jordanian industrial firms. To achieve this aim, the possibility of association between institutional investors and accounting flexibility available to firms to generate discretionary accrual was investigated. The importance of this study is its attempt to cover a lack of studies on the impact of one component of corporate governance on managing earnings practices in developing countries such as Jordan.

Many previous studies concluded that the earnings management is a familiar practice in companies (e.g. Miglo, 2007; Bissessur, 2008). It is a well known fact managers use their authority in choosing accounting methods in order to maximize their own benefits. Most of the studies that addressed the earnings management focused on the goals that drive managers to manage earnings and methods of earnings management, and most of the time ignored company-specific characteristics that affect the ability of this company to manage earnings assuming constant ability across companies. Few studies have investigated the effect of company-specific characteristics in their ability to practice earnings manipulation (e.g., Francis et al., 1999; Klein, 2002; and Chung et al., 2002).

Regardless of whether they do so or not, institutional ownerships have the ability, potential, and motivation to monitor managers in order to reduce their ability to achieve their own benefits against the shareholder's. This study examine the impact of institutional ownerships on company's ability to generate discretionary accruals in the existence of a set of control variables, which previous studies have confirmed it's significantly impact on earnings management practices, namely: managerial ownership, size, leverage, and profitability.

Using balanced panel data for all 70th Jordanian manufacturing firms listed at ASE, between the years 2000 to 2010, the study estimated the discretionary working capital accruals, proxy for the firm's accounting flexibility available, using the Jones (1991) model. The model of the study was estimated using the regression-based framework Pooled Ordinary Least Square Method (OLS). And a set of tests and analysis were conducted namely: descriptive analysis, univariate test of mean difference, correlation analysis, and regression analysis.

The findings of this study indicate a strong evidence for the impacts of the institutional ownerships on the managing earnings practice. Institutional investors found to be capable to reduce the managers' tendency towards the exercise of managing earnings. This result corresponds with the fact that institutional ownership has a surveillance role over the managers, and in order to reduce the agency problem, institutional investors have to exercise this role efficiently and effectively.

2. Related Literature

In their study Lin, L. and Manowan, P. (2011) investigate the institutional investor's effect on earnings manipulation, they differentiate between two scenarios of earnings management: decreasing and increasing income, as for decreasing income through earnings management they did not find any statistically significant impact of the institutional ownerships on the earnings management, this is the inevitable result of the difference in institutional ownerships time horizon and nature. To overcome this hurdle, the researchers classified the institutional investors according to their nature to: transient investors (investors who owned diversified and high turnover portfolios), and dedicated investors (investors who owned concentrated and low turnover portfolios). Based upon, the study concluded a direct statistically significant correlation among transient investors and managing earnings, and an inverse relationship but not statistically significant among the dedicated investors and earnings manipulation. The study also concluded that because of the difference in institutional investor nature, we cannot treat them as a homogeneous group.

Rebai, I. (2011) investigated the impact of the institutional investors on managing earnings for 123 American firms. He concluded that, while transient investors (investment funds) inspire managers to spend less on R&D, Bank Holding Company and long-term institutional investors (pension funds) are passive.

Mitra S. (2002) investigates the ability of the institutional investor to limit the practice of companies to manage earnings. The study examines the relation between the flexibility available to firms in generating discretionary working capital accruals and institutional investors. The study concluded that institutional investors reduce significantly the ability of the manager's flexibility in generating discretionary working capital accruals, and the concentrated institutional ownership reduces the tendency of the management towards managing earnings. Moreover, while the study found that the institutional investors do not have the ability to reduce the earnings management practices in S&P 500 firms; they have significant ability to reduce earnings manipulation activities in other companies.

Bushee (1998) studied the role of institutional investor in mitigating the managerial tendency towards abandoning long-term investments in order to achieve current earnings target. The study concluded that firms are not expected to manage earnings with existence of high percentage of institutional investors, which refers to the monitoring role played by institutional investors compared to individual investors. The study also concludes that the existence of high percentage of transient institutional investors leads to the possibility of increasing the practice of earnings management by reducing spending on R & D in order to increase profits. Based upon, the study indicated that the presence of high percentage of transient institutional investors in the firm leads to myopic investment behavior resulting in the sacrifice of long-term investments in order to meet the current target profit.

3. Methodology

3.1 Data

Variables utilized in the study, definition, and measures are presents at Table 1. The study employed econometric analysis using balanced panel data regression of all 70th Jordanian manufacturing companies listed at ASE for the period 2000-2010 resulting in 770 firms' year observations. The data for the firms in the sample were derived from the ASE. For the econometric analysis, the study adopted the discretionary working capital accruals (*DWCA*), a proxy for the accounting flexibility in generating accruals. Independent variable of interest is the institutional investor (*IIP*) measured by dividing institutional ownerships of common stock over total common stock. Based on previous studies, four variables that have effect on the availability of accounting flexibility in generating discretionary accruals were adopted as a control variables namely: managerial ownership (*MAO*), firms size (*SIZE*), leverage (*LEV*), profitability (*ROS*).

Table 1. Variables definition

	Variable	Measure	Notation	Expected Effect
Dependent Variable	Accounting Flexibility (earnings Management)	Discretionary working capital accruals defined as the deference between the total working capital accruals and the non-discretionary working capital accruals.	*DWCA*	
Independent Variable of interest	Institutional Investors	Ratio of institutional ownerships of common stock to total common stock.	*IPP*	?
Control Variable	Managerial ownership	Equity shares percentage owned by the managers.	*MAO*	-
	Firm's size	Logarithm of the total assets.	*SIZE*	-
	Leverage ratio	The ratio of total liabilities to total assets.	*LEV*	+
	Profitability	Income before interest and tax divided by the annual net sales	*ROS*	-

3.2 Variables

3.2.1 Dependent Variable

In the regression model discretionary working capital accruals (*DWCA*), proxy for earnings manipulation, was set as the dependant variable, measured by subtracting non-discretionary current accruals from total current accruals.

Following Jones (1991), total current accruals defined as the interaction of changes in sales minus changes in account receivables, plus plant, equipment and property, therefore, the following model were estimated:

$$TWCA_{it} = \alpha + \beta_1 (\Delta S_{it} - \Delta AR_{it}) + \beta_2 PPE_{it} + \varepsilon_{it} \quad (1)$$

TWCA: total working capital accruals, *i*: firm *i*, *t*: time *t*, Δ*:* annual change, *S*: annual sales, *AR:* account receivable, *PPE*: gross property.

To reduce the potential for heteroscedasticity the variable in equation (1) has been scaled by the total assets. The following equation has been estimated:

$$\frac{TWCA_{it}}{TA_{i,t-1}} = \alpha \frac{1}{TA_{i,t-1}} + \beta_1 \left(\frac{\Delta S_{it} - \Delta AR_{it}}{TA_{i,t-1}}\right) + \beta_2 \left(\frac{PPE_{it}}{TA_{i,t-1}}\right) + \varepsilon_{it} \quad (2)$$

Where $TA_{i,t-1}$ is the total assets.

Equation 2 is computed separately for each sample company, and DWCA is computed from the residuals of these regressions, using the coefficients estimated in equation 2, the non-discretionary component of working capital accruals has been removed. Thus the remaining accruals, discretionary working capital accruals (*DWCA*), are due to earnings management, so the following equation has been estimated:

$$\mathrm{DWCA_{it}} = \frac{\mathrm{TWCA_{it}}}{\mathrm{TA_{i,t-1}}} - \hat{\alpha}\left(\frac{1}{\mathrm{TA_{i,t-1}}}\right) + \hat{\beta}_1 \left(\frac{\mathrm{\Delta S_{it}} - \mathrm{\Delta AR_{it}}}{\mathrm{TA_{i,t-1}}}\right) + \hat{\beta}_2 \left(\frac{PPE_{it}}{TA_{i,t-1}}\right) + \varepsilon_{it} \quad (3)$$

$\mathrm{DWCA_{it}}$: Discretionary working capital accrual, $\hat{\alpha}$, $\hat{\beta}_1$ and $\hat{\beta}_2$ are coefficient estimated in equation (2).

3.2.2 Independent Variable of Interest

Independent variable of interest is the institutional investor (*IIP*). Previous studies on the impact of institutional investor on the companies concluded mixed results. Bushee, B.J. (1998) concluded that high percentage institutional investors firms tend to spend more on the R&D. However, if the institutional investor in the firm is engage in momentum trading, the possibility of the firm to reduce its spending on R&D increase to increase the profitability of the firm. Bange and Bondt (1998) concluded that increase company profits by reducing spending on R&D is less likely to occur with high percentage of *IIP*. Due to the fact that institutional investors spend more on information search, Shiller and Pound (1989) and Lev (1988) concluded that there is an inverse relationship between the aggressive practicing of earnings management by the managers and the percentage of institutional investors in the company.

In terms of institutional investor influence on the performance of the company, mixed results were documented, Smith M. (1996) concluded a direct correlation between the firm's performance and institutional investors, while Duggal and Millar (1999), Facio and Lasfer (2000) and Mizuno M. (2010) did not support this result, and concluded no statistical evidence that *IIP* influence the performance of the companies.

3.2.3 Control Variable

Four control variables with significant impact on earnings management practices were adopted, these variables are:

3.2.3.1 Managerial Ownership

Managerial ownership (*MAO*) is defined as the equity shares percentage owned by the managers. Previous studies have confirms the managerial ownerships managing earnings relationship (hence, the availability of the accounting flexibility). Warfield et al., (1995) found that as the managerial ownership increases, the possibility of earnings management decreases, because, the higher the managerial ownership percentage is, the higher is the conformity and harmony of interest between managers and shareholders, and the higher is the managerial reliability on long-term value of firms rather than short-term profit.

Managerial ownership was adopted in the model study to take into consideration the tendency of the managers to generate accruals in the presence of the institutional ownerships, and is expected to have negative impact on the firm's accounting flexibility.

3.2.3.2 Firm Size

In their study Kim, Y. et. al., (2003) concluded that the impact of firm's size on the managing earnings is different : while small firms are more than large firms engaging in earnings management to avoid disclosure of losses, larger firms are more violent in managing earnings than small firms to avoid reporting decreases in the earnings.

Size (*SIZE*), defined as the firm's total asset logarithm is expected to associate negatively with the firm's accounting flexibility.

3.2.3.3 Leverage

Leverage (*LEV*), measured by dividing total liabilities over total assets, measures the risks of the company's ability to fulfill its obligations. The higher the debt ratio, the closer the firm is to violate its debt obligation. Defond and Jiambalvo (1994) found that as the firm approachs debt-covenant violation, the possibility of engaging in earnings management increases to avoid or delay the violation. Also, Duke and Hunt (1990) concluded a direct correlation between debt ratio and inability to fulfill debt obligation. Therefore, a direct relationship between the leverage and the firms accounting flexibility available to generate discretionary accruals is expected.

3.2.3.4 Profitability

McNichols (2000) documented that including a variable of profitability in the multiple regression model increases the explanatory power of explaining the changes in the discretionary accruals, indicating that more profit firms are directly correlated with positive discretionary accruals.

Profitability (*ROS*), defined as the earnings before interest and tax divided by the annual sales, is adopted to control the effect of stockpiling inventory rise as a result of unusual business operations.

3.3 Estimation Model

To test the potential impact of *IIP* on *CWCA*, the study employed a cross-sectional regression technique. The linear regression model can be estimated as follows:

$$DWAC_{it} = \alpha + \beta_1 IIP_{it} + \beta_2 MAO_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 ROS_{it} + \varepsilon_{it} \quad (4)$$

Where; *DAWC* is the discretionary working capital accruals, as a proxy of the firm's accounting flexibility in generating discretionary accruals for i^{th} cross-sectional firm for the t^{th} time period, with $i = 1,2,3,\ldots,70$, $t = 1,2,3,\ldots,11$, α is constant, β's are unknown parameters of the firm's characteristics included in the model to be estimated, *IIP* is the institutional investors defined as ratio of institutional ownerships of common stock to total common stock; *MAO* is the managerial ownership defined as the common stock percentage owned by the managers; *SIZE* is the firm's sizes defined as the firm's total asset logarithm; *LEV* is the leverage ratio defined as the ratio of total liabilities to total assets, *ROS* is the profitability measure defined as the income before interest and tax divided by the annual net sales, and ε is the error term.

The next step is to split the firms based on the median of the institutional investor's sample firms, and conduct the univariate test of mean difference to evaluate the potential impact of institutional ownerships on the extent of earnings management practices.

Based on previous studies, the effect of institutional ownerships on the accounting flexibility is expected to be adversely. Since the firms accounting flexibility to generate discretionary accruals is directly significantly correlated with the extent of earnings management, the study predicts inverse correlation between the institutional ownerships and the firm's accounting flexibility of generating discretionary accruals.

4. Empirical Results

4.1 Descriptive Analysis

Table 2 presents the results of the descriptive analysis for the variables employed in the study. Results shows that the mean and median of the DWCA, are 4.28% and 3.3367% respectively, with a distribution range of Min. of *2.91%* and a Max. of *58.28%.*

The average institutional investor ownership in Jordanian industrial companies is *19.95%,* while the average manager's ownership in Jordanian industrial companies is 9.53%. This indicates that, because the institutional investors own twice more than managers (*19.95%* versus 9.53%) institutional investors have a better chance to influence the tendency of exercising earnings management.

Results also shows that the institutional ownership range is wide with a Min. of *0.14%* and a Max. of *68.30%,* which leads to increase the reliability of the statistical tests. Also, the distribution of manager's ownership is wide with a Min. of *0.00%* and a Max. of *49.28%.*

Table 2. Descriptive analysis results

Variables	Mean	Median	St. Dev	Min	Max
DWAC	.0428	.03367	.04368	.00291	.5828
IIP	.1995	.2150	.0809	.0014	.6830
MAO	.0953	.0577	.1087	.000	.4928
SIZE	5194.24	1130.22	18938.92	3822	212312.1
LEV	.1858	.1760	.1153	.000	.7378
ROS	.0883	.0822	.0898	-.6612	.5931

Definition of the variables presents at Table 1

4.2 Univariate Test of Mean Difference

Discretionary working capital accruals were splits based on the median of the institutional investor's variable. Table *3* shows the descriptive analysis of the two groups. As expected, for firms with IIP less than the sample median, the *DWCA* mean and median were *4%* and *3.03%* respectively, with *IIP* mean and median of *13.36%* and *13.97%* respectively, on the other hand, firms with *IIP* greater than the median sample firms, the *DWCA* mean and median were *3.12%* and *2.85%* respectively with *IIP* mean and median of *39.6%* and *40.78%* respectively.

Univariate tests showed that the difference in the mean for the IIP variable between firms with IIP less than the sample median and firms with IIP greater than the sample median is significant *(t-value=-144.22, p-value=0.000)*. Tests also showe that the *DWCA* mean's is greater for firms with IIP less than the sample median than firms with *IIP* greater than the sample median *(t-value= 269.01; p-value = 0.000).*

Univariate test results confirm the effectiveness of the monitoring role for institutional investors in reducing the tendency of the managers to practice earnings management, and thereby reduce the accounting flexibility available to the managers to generate discretionary working capital accruals.

Table 3. Distribution of discretionary working capital accruals based on the median of the institutional investor's variable

Group	IIP	DWCA
Less than the median institutional investors		
Mean	.1336	.0400
Median	.1397	.0303
St. Dev.	.1440	.0428
Minimum	.0014	.0029
Maximum	.4155	.4844
No.	385	385
More than the median institutional investors		
Mean	.3960	.0312
Median	.4078	.0285
St. Dev.	.1083	.0159
Minimum	.4594	.0011
Maximum	.6830	.5828
No.	385	385
Test of difference in the mean		
t	-144.22	269.01
p - value	0.000	0.000

Definition of the variables presents at Table 1

4.3 Correlation Analysis

Table 4 presents the correlation matrix between the regression's model utilized variables. The results show that *IPP* is significantly negatively correlated with *DWCA*, indicating that the greater the *IIP*, the lower the availability of the accounting flexibility. This result confirms the Univariate test and the descriptive analysis results mentioned earlier. The IIP is also significantly negatively correlated with *MAO,* which corresponds to the view that the institutions are reluctant to invest in firms that are dominated by the managers. Moreover, the IIP is found to be directly correlated to *SIZE* and *ROS,* verifying the role of the institutional ownerships in improving firm's performance. *SIZE* found to be negatively correlated with *DWCA*, meaning that the availability of accounting flexibility to manage earnings is lower in large firms.

The correlation results also show that the *DWCA* is significantly positively correlated with *LEV* indicating that the managers practice earnings management increases the ability of the firm to raise funds. Further, the results did not provide any significant evidence to support the relation between the *DWCA* and *ROS*.

Table 4. Correlation Matrix

Variables	DWCA	IIP	MAO	SIZE	LEV	ROS
DWCA	1					
IIP	-0.1656	1				
	0.000					
MAO	-0.0784	-0.2424	1			
	0.063	0.002				
SIZE	-0.1688	0.2168	-0.1936	1		
	0.000	0.001	0.002			
LEV	0.0904	-0.0528	0.0832	0.0528	1	
	0.041	0.271	0.039	0.117		
ROS	-0.028	0.1024	-0.0240	0.1128	-0.0976	1
	0.154	0.032	0.217	0.023	0.009	

Definition of the variables presents at Table 1, first line is the correlation coefficient, second line is the p – value.

4.4 Regression Analysis

The regression analysis is present in table 5. Two regression models were analyzed. In Model 1, control variables were excluded, and IIP found to inversely associate with *DWCA* at less than 0.01 significant level. Moreover, results shows that the IIP was able to explain 5% of the change in DWCA (R^2 = 0.051). In Model 2, the impact of institutional investors (IIP) on the firms accounting flexibility to generate discretionary working capital accruals (*DWCA*) were examined with the existence of the control variables. Even after the entering all control variables to the multiple regression model, the regression coefficient of *IIP* remain statistically significant with the negative sign *(coeff.: -4.087, p-value: 0.009).* All control variables were statistically significant and as expected, with the exception of *ROS.* Overall, the results of regression analysis support the inverse correlation between the institutional investors and the firms accounting flexibility in generating discretionary working capital accruals.

Table 5. Cross-Sectional Regressions

	Model-1			Model-2		
Variable	β	t - value	p - value	β	t - value	p - value
Intercept	.1039	8.6118	0.000	.1275	9.767	0.000
IIP	-.2339	-4.6540	0.003	-.1755	-4.087	0.009
MAO				-.0936	-2.811	0.037
SIZE				-.2632	-5.171	0.002
LEV				.1275	2.555	0.043
ROS				-.0479	-.9547	0.376
df Regression				5		
Residual				765		
Total				769		
R-Square	.051			.143		
Adjusted R^2	.0497			.1373		
F-value	41.272			25.469		
p-value	0.000			0.000		
N.	770			770		

Definition of the variables presents at Table 1

5. Conclusion

This paper aimed to investigate the potential impact of the institutional investors on the ability of the firms to practice earnings management as proxy for the availability of accounting flexibility to generate discretionary working capital accruals over eleven years from 2000 to 2010 for all 70th Jordanian manufacturing companies listed at *ASE*.

Depending on the results of various analysis and tests carried out in this study, the study found statistically significant evidence that institutional ownership have an important monitoring role over the Jordanian manufacturing companies, leading managers to reduce the tendency towards the exercise of earnings management, and thus lessen the accounting flexibility.

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Inequality of Cameroonian Households: An Analysis Based on Shapley-shorrocks Decomposition

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Abstract

The objective of this study is to explain the evolution of inequality of consumption expenditures of households in Cameroon over the period 1996-2007. To achieve this, we use the Shapley-Shorrocks decomposition of inequality by subgroups and by sources of income / expenses. The application of this method to data from Cameroon shows that expenditure on food and housing explains inequality by sources, while the expenditure distribution is much more unequal in households' headed by a man in urban area and slice aged between 31 and 50 regarding the decomposition subgroup.

Keywords: inequality, decomposition, sources, subgroup

JEL Classification: D63, I31, I32

1. Introduction

Income inequalities exist for centuries now. They were amplified with the industrial revolution of the 18th century, and this phenomenon has increased since this date (Bourguignon and Morrison, 2002). For the past years, studies on this phenomenon are marked by a social dimension of development in economic research. In this regards, questions on inequalities and poverty fuel more and more debates on the determinants of this phenomenon, as well as its link with growth and redistribution in order to identify the causes of income deprivation that some social categories undergo.

The phenomenon calls attention in Africa as a whole and Cameroon in particular. In fact, the Gini index calculated on per capita expenditure based on a purchasing power parity passed from 0.427 to 0.472 (Fambon, 2006). Cameroon, one of the countries admitted to the Heavily Indebted Poor Country Initiative (HIPCI) is not indifferent. According to 1996 and 2001 Cameroon Household Consumption Surveys (ECAM I and II), the ratio of poverty is still high even if a decrease is observed between 1996 and 2001 where this rate passed from 0.53 to 0.42 respectively, main inequality indices also decreased in this period.

This way, the squared indices of the coefficient of variation and entropy show that in 2001 income distribution parted a bit from equalitarian than in 1996, passing respectively from 1.2559 to1.5230 for the first, and from 0.4579 to 0.4936 for the second. These results indicate that inequalities are increasing instead of decreasing. However, we observe a drop in the Gini coefficient, passing from 0.4955 to 0.4512 (Fambon, 2005; Baye, 2003; Chameni, 2005, 2008; Cameroon Household Consumption Survey report, 1996, 2001).

The inequality in question here is the inequality of income/expense. Despite the contributions of multidimensional analysis in explaining the well-being, income remains an important factor that conditions the acquisition of other attributes of households (Walzer, 1995) and will be used to describe dispersion of household's expenditures. More, Understanding the mechanism that surrounds the lack of income is vital to understand the type of deprivation that can generate and the different forms of poverty that emerge. Since the literature reveals a decrease in the Gini indicator over the period 1996-2001, which is consistent with the reduction of income poverty indicator, it would be important to look at the evolution of this indicator, in order to explain these inequalities according to socio-demographic characteristics of households in Cameroon over the period 1996-2007. This is the objective we set ourselves in framework of this analysis.

To achieve this, we would resort to decomposition approaches and more specifically, the shapley-shorrocks approach that decomposes total income inequality in terms of subgroup and source income inequality. This method integrates attractive properties and opens easily to experimentation (Shorrocks, 2012).

The structure adopted allows us to present the literature on the understanding of the concept of inequality in economics (**2**). A review of the decomposition approaches (**3**) will allow us to introduce the Shapley-Shorrocks decomposition (**4**). The approach is applied to decompose inequalities of consumption expenditure (proxi of income) of Cameroonian households in the period 1996-2007 (**5**).

2. An Overview of Socio-economic Inequalities

Inequalities in living conditions existed between social classes and within these classes (Tocqueville, 1835-1840). Studies on the evolution of the phenomenon of global inequality since then have shown that they have evolved since the 17th century oscillating before knowing a rise dramatically since the early 1980s (Bourguignon and Morrison, 2002). Even in the most egalitarian societies, age and sex - criteria which are themselves beyond the possibilities of individual influence - note the differences that give rise to cultural interpretations and role assignments, positions, courses specific. These interpretations and attributions are not only differences (identity, activities, clean spaces), but also of inequality in economic, social, autonomy, power.

Socioeconomic inequality refers to differential access to economic and social assets. They are usually the result of a malfunction of the process of social mobility regulating access to favorable or unfavorable situations, stabilization or discrimination (social fragmentation). These elements are usually based on easily identifiable assets and are beyond the influence of involved persons: in particular social background (parental status), ethnicity, nationality, region, and especially sex. What is a "good" in the sense of this definition can vary in time and space, between societies and cultures as well as between subsets of the same company for a specified period, the critical importance of such property from the dominant values and the organization of society at that time. The industrial and postindustrial societies are market, hence the centrality of goods such as income, property, professional position and training (Lemel, 1991).

Inequalities can take several forms, one can distinguish between economic inequality, social and cultural, political and even ethical inequality. Each of these forms may include other specific subject of another hierarchy. Such a classification gives a multidimensional inequality. Thus if there is a similarity between the dimensions described in the analysis of inequality and poverty, it would be possible to link the two concepts to see how they interact and how policies against the poverty can reduce inequality and vulnerability in the long term. In our study, we focus in particular to traditional monetary inequality. It refers to differences between households, individuals and social groups in terms of income or consumption. It is measured by indicators such as the Gini coefficient, the Theil index of the log-variance, etc. (Dubois, 2000).

Socioeconomic inequalities refer to different realities which it is not always possible to determine with certainty the origins; they do not automatically give rise to disputes or conflicts of redistribution. They are challenged if they are not considered legitimate, hence the need, often felt by the wealthy, reduces the visibility of their social privileges or to give them justification. It is sometimes easy to conceal his/her income or expenditure; it is easy to do so by regarding the other indicators of well-being related to housing, education or employment. The analysis of inequalities arising from the possession of these attributes is therefore useful as socio-economic inequalities can challenge political democracy when their legitimacy is lacking in the long-term, hence the need to identify the causes for reduction.

3. Inequalities Analysis: Decomposition Approaches

The literature relative to the research of the determinants of income inequalities constitutes an important scope of study for economists, and it is more and more traditional to use some indices with the aim to decompose global inequality between the different variables. The literature review on the application of these analyses permits us to distinguish three (3) main categories of decomposition.

The first category concerns the case where interest is on population sub-groups as gender, age, religion, place of residence, etc. (Bourguignon, 1979; Cowell, 1980; Shorrocks, 1980, 1984; Chameni, 2005(Note 1). The second category concerns the case where the different components of total income/expenditure are examined. Here we attempt to identify the level of total income/ expenditure inequality and thereafter, to identify the contributions of the different components of income in accountable for an observed global level of income (Rao, 1969; Fei, Ranis, and Kuo, 1978; Pyatt, Chen, and Fei, 1980; Shorrocks, 1982; Chantreuil and Trannoy 1999).

The third category concerns the combination of the two uppermost categories, which permits to obtain the methods of simultaneous decompositions of inequality indices (by population sub-groups and by income/expenditure

sources). This method is based on the 'natural' decomposition of income (Shorrocks, 1982). This way, the relative contribution of total income/expenditure inequality is independent of the inequality index chosen (Mussard, 2004, 2008; Chameni, 2008).

Despite the extended use of these decomposition techniques, Shorrocks (1999, 2012) four main problems have been underlines from these traditional decomposition techniques. To go over these problems and provide a unique theoretical framework, Shorrocks (1999) resorts to an instrument of cooperative game theory, the Shapley value, and demonstrates that this approach permits to derive a good number of decomposition results. We would present the decomposition based on the Shapley value.

4. Shapley-shamrocks' inequality decomposition

Let I be the statistical indicator which value is determined by a series of n contributory factors X_i, with $i \epsilon N = \{1,2,\dots,n\}$. $I = f(X_1, X_2, \dots, X_n)$, where f describes the model to examine, for example if I is the overall level of inequality then X_i will be the contributing factors to inequality. Thereafter, it is assumed that effects of all other factors influencing the variation of I are eliminated. $V(S)$ is used to denote the value that I takes when the $X_i, i \notin S$ factors have been omitted.

It is appropriate to characterize the structure of the model $\langle N, V \rangle$ in terms of the sequence of indices of the factor N and the function $F: \{S \,/\, S \subseteq N\} \to \mathbb{R}$, as the sequence of indices of factors contribute to I completely and it would be appropriate to ensure that $V(\emptyset) = 0$. In other words I is zero when all factors are removed.

A decomposition of $\langle N, V \rangle$ is a sequence of real values, with $i \in N$ indicating the contribution of each factor. A rule of decomposition D is a function that generates a sequence of contribution factor $C_i = C_i(N, V)$, with $i \in N$ for every possible model of $\langle N, V \rangle$.

According to Shorrocks (1999) this decomposition should satisfy the properties of symmetry (or anonymity), and accuracy of the decomposition. In the process of establishing the rule of Shapley decomposition, we will consider two possibilities:

The first possibility would be to consider the contribution of each factor at its marginal impact $M_i(N, V) = V(N) - V(N - i); with\ i \in N$. This rule is symmetrical, but does not meet the accuracy requirements of the decomposition. The second possibility is to consider the marginal impact of each factor when they are removed sequentially. Let $\sigma = (\sigma_1, \sigma_2, \dots, \sigma_n)$, indicating the order in which factors are left out, and let $S(\sigma_r, \sigma) = \{\sigma_k \setminus k > r\}$ which is the result of the remaining factor after factor σ_r has been subtracted. Thus the marginal impact is given by:

$$C_i^{\sigma} = V[S(i, \sigma) \cup \{i\}] - V[S(i, \sigma)] = \Delta_i V[S(i, \sigma)];\ \forall i \in N \tag{1}$$

Where $\Delta_i V[S(i, \sigma)]$ is the marginal effect resulting from the addition of factor i to S. Shorrocks (2012) subsequently demonstrated that $\sum_{i \in N} C_i^{\sigma} = V(N)$, which allows us to assert that the decomposition of I is exact.

However the value of the contribution assigned to any given factor depends on the order in which the factors appear in the sequence σ disposal, and the factors are treated symmetrically. This type of problem is solved by considering the possible elimination of $n!$ sequences denoted by Σ and then by calculating the expected value of C_i^{σ} when the sequences in Σ are chosen randomly. This generates the rule of Shapley-Shorrocks decomposition given by:

$$C_i^S(N, V) = \sum_{s=0}^{n-1} \sum_{\substack{S \subseteq N \setminus (i) \\ |S| = s}} \frac{(n-s-1)!s!}{n!} \Delta_i V[S] \tag{2}$$

$|S|$ is the cardinality of S.

The application to the Gini index of inequality when considering population groups or income sources, allows for the decomposition into sub groups and income sources. The determination of groups or sources is conducted using a sequential elimination procedure.

The sub groups' decomposition has two steps. The first one is to decompose total inequality into inter-group and intra-group contributions. The second step consists in decomposing total intra-group inequality as a sum of group inequality. To do this, we proceed systematically simply by replacing the revenues of those in a group by the average income of that group, such as to eliminate the intra-group contribution of a given group.

The decomposition by sources with the Shapley-Shorrocks approach supposes that the contribution of component i to total inequality is the expected value of its marginal contribution when it is added randomly to anyone of the various subsets of components that one can choose from the set of all components. When a component is missing from that set, we assume that the observation values of that component are everywhere replaced by its average.

The Shapley value of each component i corresponds therefore to the mean of its marginal contributions. To determine the relative contribution of factor i, it suffices to divide the Shapley value by total inequality, as follows:

$$\varphi_i = \frac{C_i^S(N,V)}{I} \tag{3}$$

φ_i represents the relative contribution of the source i to inequality I.

5. Inequalities of Cameroonian Households between 1996 and 2007

5.1 Presentation of Data

The data bases that we will be used to illustrate our theoretical developments are part of the first economic and financial program supported by a Structural Adjustment Facility (SAF) of IMF adopted in 1995. This program has allowed the realization in 1996 of the first Cameroon Household Consumption Survey (ECAM I), on a sample of 1728 households. This partnership was renewed five years later in October 2000, in one of the entry in component C "improving information on poverty" Project Partnership between Public and Private Sector Growth and Reduction poverty (PPPCRP), with the aim to achieve in 2001, the Second Cameroon Household Consumption Survey (ECAM II). The second survey among Cameroonian households covered 10,992 households. As part of monitoring and evaluating the implementation of the Poverty Reduction Strategy (PRS) and measuring progress towards achieving the Millennium Development Goals (MDGs), the Government through the National Institute of Statistics (NIS), achieved in 2007 the Third Cameroon Household Consumption Survey with more than 11,300 households (ECAM III).

The variables we will extract from these data bases concern consumption expenditures of household for the analysis of sources of income / expense and “sociodemographic” characteristics of household heads such as age, sex, area of residence and educational level. It is worthy to note that the ECAM I data base, less elaborate than ECAM II and ECAM III has only nine variables relative to consumption expenditures as opposed to twelve variables in ECAM II. These expenditures were evaluated by household; it is then evident that the number of individuals per household is heterogeneous. Therefore there is a need to consider instead household per capita expenditure, in order to have information on the expenditure of an individual in a household.

To facilitate the analysis of the evolution of inequality in Cameroon on the period from 1996 to 2007, re-treatment of data appears necessary to render information relative to expenditures of household compatible in the period under study. To do this, let us take into consideration only expenditure variables present in the three surveys. This step leaves us with seven variables of household expenditure namely: food expenditure per head *(Food)*, clothing expenditure per head *(Clothing)*, lodging expenditure per head *(Lodging)*, health expenditure per head *(Health)*, transport and communication expenditures per head *(Transport)*, education expenditure per head *(Education)*, leisure expenditure per head *(Leisure)*.

To perform our calculations, we use the Excel software of Microsoft office 2007 and SPSS 13 software. Thereafter, we will use the DAD 4.5 software « Distributional Analysis-Analyses Distributives » (developed by researchers of the University of Laval) to calculate the level-wide and dynamic contributions of global income inequality and the contributions of each income source to total inequality.

5.2 Presentation of Results

The set of results issued from the aforementioned approach is presented in three tables:

Table 1. Inequality indices of Gini for the four variables: 1996, 2001and 2007

	Averages Expenditures						Values of Gini index					
	Year 1996	Year 2001	Year 2007	Changes 1996-01	Changes 2001-07	Changes 1996-07	Year 1996	Year 2001	Year 2007	Change 1996-01	Change 2001-07	Change 996-07
Variables	elative verages	telative verages	Relative averages	averages change	averages change	averages change						
Food	0.4430	0.4139	0.4084	-0.0291	-0.0055	-0.0346	0.488	0.404	0.373	-0.084	-0.031	-0.115
Clothing	0.0685	0.0697	0.0863	0.0012	0.0166	0.0178	0.662	0.625	0.576	-0.037	-0.049	-0.086
Lodging	0.2362	0.2271	0.2350	-0.0091	0.0079	-0.0012	0.528	0.494	0.462	-0.034	-0.032	-0.066
Health	0.1045	0.0978	0.0425	-0.0067	-0.0553	-0.062	0.651	0.636	0.703	-0,015	0.067	0.052
Transport	0.0940	0.1268	0.1618	0.0328	0.035	0.0678	0.754	0.749	0.674	-0.005	-0.075	-0.08
Education	0.0399	0.0440	0.0445	0.0041	0.0005	0.0046	0.725	0.784	0.738	0.059	-0.046	0.013
Leisure	0.0138	0.0204	0.0214	0.0066	0.001	0.0076	0.880	0.903	0.783	0.023	-0.12	-0.097
Total	1	1	1				0.487	0.453	0.412	-0,034	-0.041	-0.075

Table 1 displays the inequality indices of Gini for the seven (7) variables as well as their average values and the observed changes at this level for the three periods of reference. The analysis of table (1) reveals that consumer spending over the period of analysis are devoted to about 40% on food, contrary to spending on leisure which represent less than 1% of household expenditures in Cameroon during the period. It is noted that housing costs represent just about 20% of household expenditure. The remaining expenditures are consecrated to clothing, health, education, transport.

We can observe generally that all the expenditure variables registered an increase between 1996 and 2007. This indicates an amelioration of living standards of Cameroonians between these dates, if we assume that prices have remained stable over the period. Concerning the values of Gini indices associated to our variables, we observe that food expenditure per head; notwithstanding the fact that households consecrate in average a greater portion of their expenditures in it has the smallest Gini value for the three periods (0.488 in 1996, 0.404 in 2001 and 0.373 in 2007).

On the contrary, the leisure expenditure, despite its reduced proportion in average household expenditure has the highest Gini value for the three periods (0.880 in 1996, 0.903 in 2001 and 0,783 in 2007). This suggests a tremendous impact of leisure expenditure on the level of total household expenditure inequality. Food expenditure experienced a considerable drop in its index value, from 0.488 in 1996 to 0.377 in 2007.

Table 2. Contributions of variables according to Shapley-Shorrocks attribution rule

	Absolute contribution			Relative contribution		
Variables	1996	2001	2007	1996	2001	2007
Food	-0.020	0.078	-0.077	-0,041	-0.171	-0.186
Clothing	0.079	0.071	0.061	0,163	0.156	0.149
Lodging	0.024	0.015	0.015	0,049	0.034	0.035
Health	0.074	0.075	0.090	0,151	0.165	0.219
Transport	0.117	0.129	0.116	0,239	0.285	0.281
Education	0.087	0.105	0.092	0,179	0.231	0.224
Leisure	0.126	0.136	0.114	0,259	0.299	0.279
Total	0.487	0.453	0.412	1	1	1

Table 2 presents the contributions of different variables according to the shapley-shorrocks attribution rule. The table shows that over the period, the sources of income / expenses that contribute least to the level of inequality is the total power expenditure (- 4.1% in 1996, 17% in 2001 and -18.6% in 2007), while spending on leisure, as we announced earlier have the highest level of contributions to total inequality (25.9% in 1996, 29.9% in 2001 and 27.9% in 2007).

Food expenditure contributes the smallest in average to total inequality, more so its contribution is negative, which indicates that food expenditure contributed to reduce the global level of inequalities. On the contrary, leisure expenses contributed heavily to the observed level of total inequality.

Table 3. S-Gini Decomposition by Groups (Inequality)

	Decomposition to the between & within Group Components																		
	Between Group						Within Group						Decomposition of the Within Group Component						
	Absolute value			Relative value			Absolute value			Relative value				Absolute value			Relative value		
	1996	2001	2007	1996	2001	2007	1996	2001	2007	1996	2001	2007	Subgroups	1996	2001	2007	1996	2001	2007
SEX	0.010	0.001	0.001	0.020	0.001	0.003	0.477	0,453	0.410	0.980	0.999	0.997	Men	0.393	0.347	0.305	0.808	0.767	0.740
													Women	0.084	0.106	0.106	0.172	0.232	0.257
AREAS	0.121	0.103	0.094	0.248	0.227	0.229	0.366	0.350	0.317	0.752	0.773	0.771	Urban	0.276	0.191	0.201	0.566	0.422	0.487
													Semi-urban	0.020	0.062	0.032	0.041	0.137	0.078
													Rural	0.071	0.097	0.085	0.146	0.214	0.206
EDUCATION	0.144	0.129	0.1210.295		0.285	0.294	0.343	0.324	0.291	0.704	0.714	0.706	No education	0.075	0.078	0.065	0.154	0.172	0.158
													primary education	0.093	0.099	0.094	0.191	0.218	0.228
													secondary education	0.140	0.117	0.108	0.287	0.258	0.261
													higher educational level	0.035	0.0299	0.024	0.073	0.066	0.059
AGE	0.059	0.048	0.039	0.122	0.106	0.095	0.428	0.405	0.372	0.878	0.893	0.905	[0-21[	0.004	0.008	0.014	0.008	0.019	0.034
													[21-31[	0.078	0.086	0.085	0.160	0.189	0.205
													[31-41[	0.138	0.108	0.100	0.284	0.239	0.242
													[41-51[	0.099	0.088	0.085	0.204	0.195	0.206
													[51-61[	0.069	0.067	0.049	0.143	0.148	0.118
													[61-100[	0.039	0.047	0.041	0.080	0.104	0.098

Table 3 is dedicated to the decomposition of inequality by subgroups. As announced earlier, we selected subgroups for gender of household head, area of residence, educational attainment and age of household head. The overall pattern that emerges shows a strong involvement of the within group component to total inequality over the entire study period. This reflects the fact that inequality is much explained by observable characteristics within the groups. This component of the intergroup gradually decreases over the period in favor of the within group component. The decomposition of the latter could provide an explanation to this global trend.

The analysis of the within group by gender reveals that there is a wide dispersion of consumer spending between householders male, since the inequality between men heads of households over the period contributes more than 0.73 to the inequality of within group, while the female heads of households contribute less than 0.26 in the within group inequality. However, there is a decrease in inequality within households which are headed by a man (whose relative contributions increased from 0,808 in 1996 to 0.74 in 2007), and an increase in inequality in consumption of household heads females (including the relative contributions of 0172 passed in 1996 to 0,257 in 2007).

The decomposition of the within group by place of residence can show that the inequality is very pronounced among heads of households living in urban areas throughout the study period. The contribution of household heads in rural areas is less important. Consumption expenditure of household heads in urban areas accounted for most of the component of the within group. However, there is an increase in inequality in rural areas and falling out inequality in urban areas. Inequality observed in semi urban areas are the lowest.

The decomposition of the within group by level of education shows that heads of households who have an education level corresponding to primary and secondary levels contribute about 50% at the within group component. It is these categories that account for most of the inequality of within group when the break occurs according to the level of education. Household heads with an educational level equivalent to higher education have an income level slightly more homogeneous than the other categories.

The decomposition of the within group according to age groups shows that heads of household aged under 21 have distributions of consumption expenditure as homogeneous over the period. The strong dispersions observed in the cutting age are attributable to consumption expenditure of household heads aged between 31 and 50.

6. Conclusion

The objective of this study was to evaluate the evolution of inequality of consumption expenditures of households in Cameroon over the period 1996-2007. The developments carried out in this study have enabled us to note that, beyond the fact that the literature on the conceptualization and measurement of inequality is rich and varied. The application of the Shapley value to analyse inequalities by sources and by subgroup presents interesting properties. In fact, one of the advantages of this value is that it possesses a good number of characteristics that permit its application in diverse domain where there is the question of coalition and share.

From the results of our study, we can generally conclude that, on the one hand, food expenditure on average contributes less to total inequality, more so the contribution of this source has a negative sign, indicating that it has contributed to reduce global inequalities. On the other hand, leisure expenses contribute strongly to the observed total inequality and we observe from table 2 that the decrease in total inequality of the study period is largely explained by food expenditure. Food and lodging expenses appear to be vital in the explanation of inequalities by source of expenditure in Cameroon.

Decomposition by subgroup has revealed that the within group explains just about 70% of the inequality observed in decompositions by gender, area of esidence, educational level and age. The decomposition of the within group shows that the dispersion of consumer spending for male household heads is larger than for women heads of households. Householders living in urban areas concentrate the greater dispersion of expenditure. Household heads with an educational level equivalent to higher education appear to have a more homogeneous structure of expenditure, while the strong dispersion observed in the distribution by age is explained by the expenditures of household heads aged between 31 and 50.

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Notes

Note 1. Chameni (2005) proposed a new decomposition in sub-groups of the Hirschman-Herfindahl index in three components: intra group, net inter group and over-lapping inter group, before proposing a simultaneous decomposition in sub group and in income source.

Appendices

The Shapley value applied to the analyses of inequalities by sources highlights the following remarks:

Remark 1: according to Shorrocks (1999), the contribution of Shapley for an income source equally distributed is zero. Consequently, source inequalities are equal and the contribution of these sources to total inequality is zero. This is clearer when the inequality index used is an absolute index as the variance. This problem is resolved by using relative inequality indices as the Gini index or the square of the coefficient of variation. But these relative indices give negative marginal contributions. This proposal justifies the fact that in the configuration of a game that treats inequality by equalised source, relative indices be preferred over absolute indices.

Remark 2: according to Chantreuil and Trannoy (1999), the relative Gini index when applied to the attribution of source contributions to total inequality, for Shapley, games having equalitarian distribution of some sources do not coincide with the decomposition of the Gini index as it attributes always zero contributions to sources distributed equally. However, it is important to note that the inequality decomposition of Shapley using variance as inequality index is nothing other than the natural decomposition of the variance.

These remarks have permitted the elaboration of a set of strong criticisms against the Shapley-shorrocks and its applicability to the analysis of inequality by sources, criticisms that can be found in summary in the article of Sastre and Trannoy (2002). The latter proposes the nested form of Shapley decomposition basing on the extensions brought by Owen (1977) to the original value of Shapley.

Does Gravity Model Fit Sudan's Trade Patterns?

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Abstract

This paper explains bilateral trade patterns between Sudan and 16 Arab countries over the period 1990-2009 using augmented gravity model. The estimation results show that the gravity equation fits the data reasonably well. Estimates of population, GDPs of Arab countries and distance elasticities are as expected. The Heckscher-Ohlin theory explains inter-industry, instead of intra-industry, highlighting competitiveness rather than complementarity between Sudan and Arab countries.

Keywords*:* bilateral trade, gravity model, competitiveness, complementarity, trade conformity index

JEL codes: C51, F14, F15

1. Introduction

In an anticipation to drive some gains from the international trade most countries, particularly the developing ones, have introduced economic reforms and joined bilateral and regional trade agreements. The economic reforms that have been launched by Sudan in early 1991 impacted its trade and external sector positively. This is evident as the trade to gross domestic product (GDP) ratio increased from 14 per cent for the pre-reform period (1980-1991) to 23 per cent after the reform period (1992-2009). Also, Sudan's exports as a share of the world exports have improved substantially from 0.48 per cent in the 1980s to 0.56 per cent during 1991-96 and attained 0.71 per cent in 2001-2002, the highest achieved so far since the 1970s.

Sudan's main exports to Arab countries are composed of agricultural products, Live and slaughtered animals while Sudan's main imports from Arab countries are utensils, cement, petroleum products, and cosmetics. Machinery and equipments, and vehicles are the items of re-export. The average share of this trade is 9 per cent and recently, their importance and value have increased owing to inter alia economic sanctions and deteriorating political relations with the West caused by problems in South Sudan initially and Darfur later on. Moreover, the Arab Investment and Export Credit Guarantee Corporation statistics showed that Sudan occupied the second recipient of the inter-Arab investment in 2010, attracting US$ 23.3 billion during the period 1995-2010.

Given the importance of foreign trade to the Sudanese economy, and the weight of the Arab countries as major trading partners of Sudan, it is necessary to identify the main factors that influence the trade flows between Sudan and the Arab world. This paper aims to test if the gravity model is relevant to explain Sudan's bilateral trade patterns with 16 Arab countries, including Jordon, the United Arab Emirates, Bahrain, Tunisia, Algeria, Saudi Arabia, Syria, Iraq, Oman, Qatar, Kuwait, Lebanon, Libya, Egypt, Morocco, and Mauritania.

The rest of the paper is structured as follows. Section 2 presents a review of the empirical literature on gravity model and its application for analyzing trade patterns and policy analysis; section 3 describes the data and the methodology; Section 4 presents empirical results and discussion, and section 5 is concludes and offers some policy recommendations.

2. Empirical Literature Review

The gravity analysis is used extensively to evaluate various trade policy issues such as: **a**) trade flows - **(**Harris-1998, Zarzoso 2000, 2003, Burguet 2002, Batra 2004, Chan 2005, Claudio 2006, Westerlund 2006, Jacques 2006, Martin 2008, Lawless 2009, Nuroglu, 2009, and Kepaptsoglou 2010, Nuno 2010, Anderson 2011, Peter 2011**)**; **b**) workers'

remittances **(**Lueth 2006; **c)** Immigration (Lewer 2008, Constantin 2004, and Letouse 2009**)**; **d)** foreign direct investment (FDI) **(**Arranz 2006, and Deroza 2007); **e)** external debt **(**Andrew 2004, and Mark 2004**)**; and **f)** financial prediction (Breton 2007).

Gravity models have achieved empirical success in explaining various types of inter-regional and international trade flows (Cheng 2005), and gained their popularity from their high explanatory power, data readiness, and availability of established standard practices that facilitate the work of researchers (Ben 2006).

Kepaptsoglou (2010) critically reviewed and analyzed recent empirical studies exploiting the gravity model in trade flows. Over 75 papers in the last decade have either used it for analyzing trade policies and their implications or improved its performance. Nuroglu (2009) extended the original gravity model of bilateral trade with population and volatility of exchange rates, and then used this modified gravity model in a panel data analysis. It shows how income and population of a country, distances between two countries and volatility of exchange rates affect bilateral trade flows among 6 big countries of the Organization of Islamic Countries (OIC0.The empirical literature using gravity models is very abundant. Lawless (2009) used a gravity model approach in order to analyze the geographical patterns of Irish exports. The gravity model in international trade has been demonstrated to be an extremely robust empirical method. The gravity model is first applied to aggregate Irish exports from 1980 to 2007. Distance is found to have a strong negative effect on exports. On the other hand, exports are positively related to sharing a common language and when communications infrastructure is well developed. Derosa's (2007) gravity model is based on bilateral merchandize trade flows and inward shocks of FDI among 170 countries from 1976-2005. The gravity model predicted impacts of Maghreb economic integration on merchandize trade and FDI for Arab Maghreb Union (AMU), countries are expected to materialize over a horizon of two to five years. Chan (2005) showed, via gravity model, that Korea's trade relies on the Heckscher – Ohlin pattern with more inter-industry relative to intra-industry trade. Batra (2004) used an augmented gravity model equation with maximum possible geographical coverage of world trade to estimate global trade potentials for India's trade flows. The variables used included infrastructure endowments, squared differences in per capita incomes, and real exchange rates. Panel data analysis was used to find that fixed effects model is preferred to random effects. Zarzoso (2003) augmented the standard gravity model with a number of variables to test whether they are relevant in explaining the bilateral trade flows between the European Union and Mercosur.

Lewer (2008) developed a gravity model of immigration using panel data for 16 Organization of Economic cooperation and Development (OECD) countries for the period 1991–2000. The model illustrated its usefulness for testing other hypothesized determinants of immigration i.e. population, GDP per capita ratio, distance, number of source country natives, property rights, common trading bloc, common boarders, colonial histories, rule of law, and language. Constantin (2004) emphasized the role of gravity models in various fields of spatial interaction analysis, focusing on market area boarder, commodity flows, and migration.

Lueth (2006) estimated a gravity model for remittances using a dataset from 11 countries in Asia and Europe for the period 1980–2004. The estimated gravity model, used to explain trade, FDI flows, and workers' remittances that describe the relationship between workers' host and home country, distance, common border, shared history, or bilateral trade, Additional variables were incorporated into the model such as: dependency ratio and an indicator of natural disasters. The model derived implications about the cyclical properties of remittances and their role in limiting vulnerability to shocks.

Breton et *al* (2007) applied the methodology of gravity models to study relationships between firms and analysts forecasts for earnings of 241 French firms over the period 1997-2007. They proposed a measure of soft information by regressing analysts forecast errors on observable firm-specific, analyst-specific and both firm- and analyst-specific characteristics, and the disturbance effect has been decomposed in order to extract a pair-specific effect.

3. Data and Methodology

3.1 Data

The data have been collected mainly from the Arab Monetary Fund Statistical Bulletin, and are all valued in terms of US dollars. Figure (1) depicts trade flows of Mauritania, Morocco, Algeria, Tunisia, Egypt, Kingdom of Saudi Arabia, Jordon, Syria, Iraq, Libya, Lebanon, Oman, Yemen, Bahrain, Kuwait, and Qatar respectively**.**

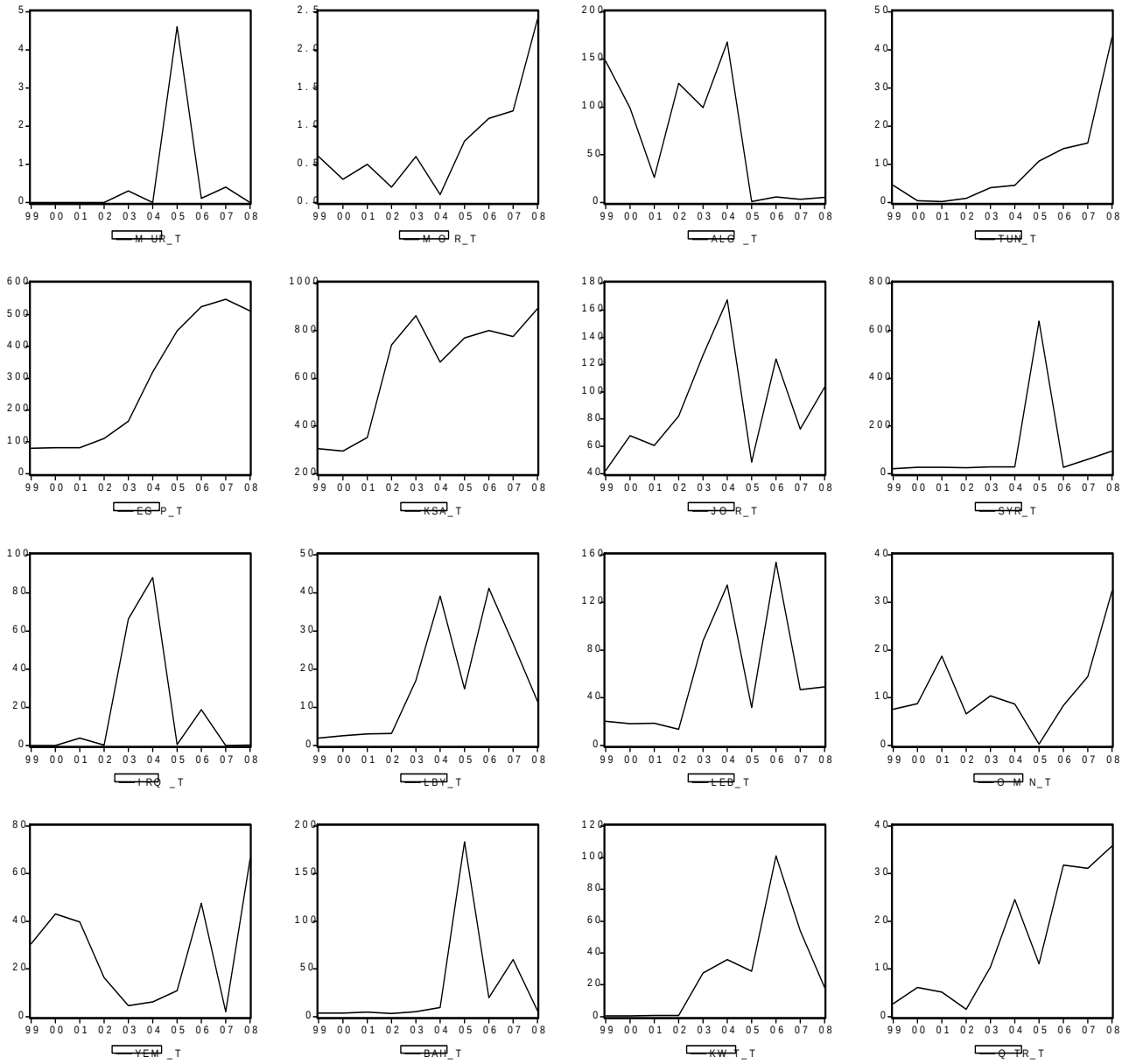

Figure 1. Sudan's Trade with Arab Countries

3.2 Gravity Models

The paper uses the gravity model approach to assess the trade patterns of Sudan with 16 of its main Arab trading partners for the period 1990 -2009.

Standard Gravity models utilize the gravitational force concept as an analogy to relate trade flows between countries to the size of their markets and the cost of moving goods between them. Bilateral trade volume (physical gravitational force) increases with the product of economic sizes (gravitational mass) and decreases with geographical distances (gravitational distance) (Chan 2005). The standard gravity models was augmented with many variables to embody a large number of explanatory variables of which are first traditional gravity effects i.e. joint GDP, joint population, and Distance between two capitals Batra (2004) considered distance as a proxy for transport costs, and an indicator of the time elapsed during shipment, c) synchronization costs: when factories combine multiple inputs, the timing of these needs to be synchronized so as to prevent mergence of bottlenecks, d) distance may be correlated with the costs of searching for trading opportunities an-d the establishment of trust between potential trading partners, e) cultural distance: It is possible that greater geographical distance is correlated with

larger cultural differences. Cultural differences can impede trade in many ways such as inhibiting communication, clashes in negotiating styles etc. Second joint GDP per capita, land area, FDI shocks, infrastructure (stock of public capital and length of motorway network), real exchange rate, foreign currency reserves, binary variables that are unity if i and j have the same: language, common border, landlocked, Island, common colonizer, currency, current colony, ever a colony, common country, and generalized system of preferences (GSP), Zarzoso (2003) suggests that high level of GDP in exporting country indicates high production which increase the availability of goods for export, while high level of income in importing country suggests higher levels of import. Population variables may have positive or negative coefficient depending on the absorption or economies of scale effects. and distance, which provides a broad proxy for the transportation and other costs involved in exporting to country j. Nuroglu, (2009) showed that the higher the population of exporting country the higher the production and exports as a result since it may increase the amount of labor force, and the level of specialization, the higher population of the importing country is expected to decrease income per capita which may lower the need for imports and also the level of exports. Per capita GDP serves as a proxy for income level and/or purchasing power of the exporting and importing countries. The Newton's Law-based Normal Trade is specified first in non-linear form as follows:

Normal trade is specified first in gravity non-linear form as follows:

$$X_{ij} = \beta_0 Y_i^{\beta_1} Y_j^{\beta_2} P_i^{\beta_3} P_j^{\beta_4} D_{ij}^{\beta_5} A_{ij}^{\beta_6} \mu_{ij} \quad (1)$$

where $Y_i(Y_j)$ indicates the GDP of exporter (importer), $P_i(P_j)$ population of exporter (importer), D_{ij} distance between the two countries, A_{ij}represents any other factors aiding or preventing trade between pairs of countries, and $\mu_{ij}$is the error term captures any other shocks and chance events that may affect bilateral trade between the two countries. Taking logarithms of both sides of model (1) we obtain log-log linear equation:

$$x_{ij} = \beta_0 + \beta_1(y_i) + \beta_2(y_j) + \beta_3(p_i) + \beta_4(p_j) + \beta_5(d_{ij}) + \sum \beta_{ij} a_{ij} + \mu_{ij} \quad (2)$$

where, small letters denote the natural logarithm of the variables. Model (1) can be augmented by real exchange rate(e_{ij}), infrastructure(I_i, I_j), and FDI (F_i, F_j) in equation (3):

$$x_{ij} = \beta_0 + \beta_1(y_i) + \beta_2(y_j) + \beta_3(p_i) + \beta_4(p) + \beta_5(e_{ij}) + \beta_6(i_{ij}) + \beta_7(i_{ij}) + \beta_8(f_{ij}) + \beta_9(F_{ij}) + \sum \beta_{ij} D_{ij} + \mu_{ij} \quad (3)$$

Chan-Hyun (2005) added trade conformity index (TCI) to the gravity equation to identify trade patterns whether based on Heckscher-Ohlin trade model or differentiated product increasing returns model. TCI measures the degree of complementarities between two countries. Calculated as follows:

$$TCI_{ij} = \sum [X_{ki} \times M_{kj}] / \sum [X_{ki}^2 \times M_{kj}^2] \quad (4)$$

where:

X_{ki} = share of commodity k in exports of country i

M_{kj} = share of commodity k in imports of country j

i and j = 1,2,…,N (i refers to the reporter country and j refers to the partner country)

k = 1,2,…,n (refers to a commodity group)

TCI values ranges from 0 (perfectly competitive trade structure) to 1 (perfectly complementary trade structure).

The estimation of gravity models encounters two problems, i.e. heteroscedasticity and zero trade flows. With the existence of heteroscedastic errors log linear model cannot be expected to provide unbiased estimates of mean effects, the second concern arises from the existence of zero values of the dependent variables that are unidentified when converted into logarithms for estimation. Econometrics solutions were provided by (Burguet 2002), (Cheng 2005), (Westerlund Feb 2006), (Martin Feb 2008). (Letouse 2009).. (Burguet 2002) estimated non-linear gravity equation augmented with technological innovation and transport infra structure variables in order to analyze the impact of these variables on trade. Cheng *et al* (2005) showed that the bias problem will be eliminated if the estimation is carried out in two-way fixed effects model in which country-pair and period dummies are used to reflect the bilateral relationship between trading partners. Westerlund *et al,* (Feb 2006), proposed estimating the gravity model directly from its non-linear form by using the fixed effects Poisson maximum likelihood (ML) estimator. Since this removes the need to linearize the model by taking logarithms, the problem with zero trade disappears. Martin *et al* (2008) estimated the gravity model allowing for heteroscedasticity and zero bilateral trade flows, and they proposed the Poisson Pseudo Maximum Likelihood (PPML) as an alternative estimator. Letouse (2009) presented empirical estimates of a gravity model of bilateral migration that properly accounts for

non-linearity and tackles causality issues through an instrumental variables approach.

3.3 Common Coefficients

Explanatory variables are to have the same coefficient across all cross-section members of the pool. A single coefficient will be included for each variable, and will label the output using the ordinary or pool name, as appropriate. There is an option of using cross section weights via generalized least squares (GLS) i.e. using estimated cross-section residual variances.

3.4 Fixed Effects Model

The fixed effects model (FEM) is an unrestricted model as it allows the intercept and other parameters to vary across trading partners. It is appropriate when the unobservable element α does not vary over time and when COV $[\alpha_i X_i]$ ≠0. When the fixed effect model is run, $\widehat{\beta}$ is identified from individual variation in $X_i$around the individual mean, i.e. $\hat{\beta}$ is estimated of those which switch (change x over time).The $\alpha_i's$ are unbiased, but inconsistent if T is fixed (Jurajda 2003). The fixed effects capture those factors such as physical distance, the length of the border (or contiguity), history, culture, and language that are constant over the span of the data and that are correlated with the volume of bilateral trade. FEM would be a better choice when one is interested in estimating typical trade flows between an ex ante predetermined selection of nations (Egger, 2000).

3.5 Random Effects Model

The random effects model (REM) treat effects as random absorbed into the error term so it specifies a particularly simple form of the residual covariance structure, namely$\in_i = \alpha_i + \mu_{it}$ with$E[\alpha_i \alpha_j]=\sigma_\alpha^2$ α if i = j and is 0 otherwise. Other than the only covariance is between μ_{it} and μ_{jt} which is σ^2 (Jurajda 2003). This procedure is consistent, provided that the number of missing observations is asymptotically negligible (Pindyck 1976).REM would be more appropriate when estimating typical trade flows between randomly drawn samples of trading partners from a larger population

3.6 Preferred Model

To choose between the GLS and FEM specification we used the J-test proposed by Davidson and MacKinnon (1993). If one model is the correct model, then the fitted values from the other model should not have explanatory power when estimating that model. Annex (8) shows that the J-test failed to reject both models i.e. GLS and FEX, meaning that the data do not provide enough information to discriminate between the two models.

4. Empirical Results

4.1 Model Results

Annex (1) shows the main results of the standard gravity model, where T1, P1, and, Y1 are natural logarithms of total foreign trade, population, and GDP of the exporter country. And T2, P2, Y2, and TCI2 are natural logarithms of total foreign trade, population, GDP, and Trade Complementarily Index of the importer country. While D1 is the distance between 16 capitals of Arab countries and the capital of Sudan, The signs of all the estimated coefficients are compatible with a priori theoretical explanations except the sign of GDP of the Sudan.Judging by the overall statistical and econometric diagnostic tests i.e. t statistic, F statistic, R squared, Adjusted R squared, and, Durbin Watson, the estimated coefficients are statistically difrrent from zero, and no presence of serial correlation. The results suggest that a high level of GDP of Sudan does not increase the foreign trade, while high levels of income in Arab countries suggest higher levels of bilateral trade with Sudan. Results show that an increase in the importer's GDP causes an increase in imports from Sudan. The sign of the Sudan's population is positive indicating more production and hence more bilateral trade, while it is negative for the importing countries reflecting the lack of absorption or economies of scale effects. Larger countries have a greater capacity to absorb imports than do their smaller counterparts. The coefficient of the distance variable has the expected negative sign and is highly significant. All other variables that augment the gravity model have an insignificant coefficient, implying that they do not have an impact on bilateral trade with Sudan. The model previously suffers from autocorrelation, correcting for autocorrelation by Cochran-Orcutt procedure removed the autocorrelation and increased the explanatory power of the model to reach .98 percent instead of 77 percent for the weighted statistics, and from 28 per cent to 59 per cent for unweighted statistics. However, the FEM in Annex (4) gave poor results; none of the standard gravity model variables is significant. The REM is near singular and cannot be estimated because its determinant is zero and

cannot be inverted. Concerning the two problems i.e. heteroscedasticity and zero trade flows, the first was catered for by applying White Heteroscedasticity Consistent Covariance, the other problem was not encountered.

4.2 Discussion

The coefficient of Sudan income is negative, therefore not compatible with a priori theoretical explanations, this is caused mainly by one of four possibilities i.e. trade -barriers, home-market effect, lower level of inter- industry trade, or government policies. Despite persistent efforts by the government to liberalize trade. The Index of Economic Freedom in Sudan indicated that trade with Sudan was subject to a high weighted average tariff rate of 11.4 percent in 2008. Import restrictions, discriminatory taxes, delays in customs clearance and non-transparent regulations are some of the factors impeding Sudanese trade The possibility of significant 'home-market' effect is refuted by the fact that the Sudan GDP is totally dependent on the GDP's of partner countries j, which implies either no effect or neutral effect of the home-market effects (Davis and Weinstein, 2003). The third possibility is confirmed by *TCI) which is close to zero for all Arab countries implying closer perfectly competitive trade structure through intra-industry trade. Sudan and other Arab economies depend to a greater extent on outside world which means that their degrees of openness are high therefore are exposed to external shocks. Their total foreign trade is increasing as a ratio to GDP. The most obvious features of Arab foreign trade is its dependence on primary goods i.e. oil, gas and agricultural products, the price of which are volatile causing difficulties for Arab countries to finance their imports (Kimbish. 2003). Traditionally, most of Sudan's exports to Arab countries are in the form of live and slaughtered animals, cotton, gum Arabic, and groundnuts. There are many problems associated with this; first there is a risk of rejecting the exported live animals, either for health or political reasons. Secondly, most export products come from the traditional sector which is subject to weather hazards, using obsolete production techniques, depending on imported inputs, and subject to price volatility. Thirdly, these exports are constrained by transpiration and storage facilities, in addition to the heavy taxes and customs charged on them. The recent exploration and exportation of oil which is supposed to support these exports have led to a surge in import of luxury goods at the expense of investment (capital) goods. There is a need to diversify the traditional agricultural exports and encourage trade through the slashing of all types of trade barriers.

5. Conclusion

The aim of this investigation was to estimate a gravity equation to explain patterns of Sudanese bilateral trade with Arab countries. Results of the model indicated that all the variables included in the gravity equation revealed the expected signs, except for the GDP of Sudan. The estimated coefficients yielded in most cases, the expected signs and magnitudes. The coefficient for the exporter population variable is negatively signed which shows an absorption effect, the greater the size of the exporter, the lower the exports. However, the estimated coefficient corresponding to the importer population is negatively signed (the sign is positive which points towards the growing importance of the role played by scale economies and market-size effects in international trade models. Concerning geographic distance, its coefficient presents a negative sign. The TCI showed that Sudan and its Arab trade partners have competitive trade structure through intra-industry trade. This calls for Sudan for more economic reforms in order to promote trade with Arab countries and other partners.

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Annex 1. Estimation Results of Augment Gravity Model

Dependent Variable: ?T2
Method: GLS (Cross Section Weights)
Date: 04/06/12 Time: 09:41
Sample: 1999 2008
Included observations: 10
Number of cross-sections used: 16
Total panel (unbalanced) observations: 140
Convergence achieved after 14 iteration(s)
White Heteroskedasticity-Consistent Standard Errors & Covariance
Cross sections without valid observations dropped

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	22.06823	8.244188	2.676822	0.0084
P1	7.471462	2.656347	2.812683	0.0057
?P2	-0.161288	0.059612	-2.705627	0.0077
Y1	-0.740544	0.364333	-2.032603	0.0441
?Y2	0.646520	0.120426	5.368618	0.0000
?D2	-5.647972	0.732987	-7.705421	0.0000
AR(1)	0.732041	0.057266	12.78318	0.0000

Weighted Statistics

R-squared	0.983423	Mean dependent var	7.585127
Adjusted R-squared	0.982675	S.D. dependent var	10.98014
S.E. of regression	1.445269	Sum squared resid	277.8108
F-statistic	1314.988	Durbin-Watson stat	2.462477
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.585286	Mean dependent var	3.095301
Adjusted R-squared	0.566577	S.D. dependent var	2.195295
S.E. of regression	1.445270	Sum squared resid	277.8110
Durbin-Watson stat	2.617996		

Annex 2. Estimation Results of the Basic Gravity Model

Dependent Variable: T2
Method: GLS (Cross Section Weights)
Date: 04/06/12 Time: 08:29
Sample: 1999 2008
Included observations: 10
Number of cross-sections used: 16
Total panel (unbalanced) observations: 140
Convergence achieved after 10 iteration(s)
White Heteroskedasticity-Consistent Standard Errors & Covariance
Cross sections without valid observations dropped

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-18.78385	8.977728	-2.092273	0.0383
P1	11.26818	2.775762	4.059491	0.0001
P2	-0.169202	0.055455	-3.051175	0.0028
Y1	-0.757553	0.372506	-2.033667	0.0440
Y2	0.332625	0.086306	3.854023	0.0002
D	-2.004682	0.811875	-2.469200	0.0148
TCI2	-0.382502	0.064996	-5.884980	0.0000
AR(1)	0.573634	0.074800	7.668885	0.0000
Weighted Statistics				
R-squared	0.984227	Mean dependent var		7.269648
Adjusted R-squared	0.983391	S.D. dependent var		10.32830
S.E. of regression	1.331084	Sum squared resid		233.8757
F-statistic	1176.680	Durbin-Watson stat		2.386243
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.650872	Mean dependent var		3.095301
Adjusted R-squared	0.632357	S.D. dependent var		2.195295
S.E. of regression	1.331085	Sum squared resid		233.8760
Durbin-Watson stat	2.591307			

Annex 3. Trade Conformity Index

Country	TCI
Jordon	0.000230829
UAE	4.06E-06
Bahrain	0.096414964
Tunisia	0.003611659
Algeria	0.273890444
KSA	1.13803E-05
Syria	0.000192853
Iraq	0.151057402
Oman	0.137564508
Qatar	0.09742982
Kuwait	0.002240615
Lebanon	0.000676499
Libya	0.007851144
Egypt	3.50E-05
Mauritania	0.000000000
Yemen	0.003620936

Annex 4. Results of Fixed Effect

Dependent Variable: T2
Method: Pooled Least Squares
Date: 04/06/12 Time: 08:37
Sample: 1999 2008
Included observations: 10
Number of cross-sections used: 16
Total panel (unbalanced) observations: 140
Convergence achieved after 30 iteration(s)
White Heteroskedasticity-Consistent Standard Errors & Covariance
Cross sections without valid observations dropped

Variable	Coefficient	Std. Error	t-Statistic	Prob.
P1	22.10266	12.45013	1.775296	0.0784
P2	0.249532	0.267312	0.933487	0.3525
Y1	-1.488364	1.508657	-0.986549	0.3259
Y2	-0.319194	0.372753	-0.856314	0.3936
D2	3.357974	1.51E+14	2.22E-14	1.0000
TCI2	-4.523335	1.16E+14	-3.89E-14	1.0000
AR(1)	0.246056	0.115696	2.126744	0.0355
		Fixed Effects		
JOR_--C	-119.1187			
UAE_--C	-136.6949			
BAH_--C	-94.00107			
TUN_--C	-111.6240			
ALG_--C	-90.85542			
KSA_--C	-129.9983			
SYR_--C	-120.8013			
IRQ_--C	-91.34836			
OMN_--C	-93.66948			
QTR_--C	-93.56932			
KWT_--C	-110.8228			
LEB_--C	-115.0466			
LBY_--C	-106.1633			
EGP_--C	-126.1482			
MOR_--C	-87.06421			
YEM_--C	-107.3618			
R-squared	0.707519	Mean dependent var		3.095301
Adjusted R-squared	0.652523	S.D. dependent var		2.195295
S.E. of regression	1.294064	Sum squared resid		195.9284
F-statistic	47.17111	Durbin-Watson stat		2.180591
Prob(F-statistic)	0.000000			

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Annex 5. Home –Market effect

Dependent Variable: Y

Method: GLS (Cross Section Weights)

Date: 03/18/12 Time: 16:55

Sample: 1999 2008

Included observations: 10

Number of cross-sections used: 16

Total panel (balanced) observations: 160

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6295.491	618.4412	-10.17961	0.0000
JOR_--JOR_Y	3.141182	0.115620	27.16820	0.0000
UAE_--UAE_Y	0.297432	0.006246	47.61873	0.0000
BAH_--BAH_Y	2.988741	0.077697	38.46647	0.0000
TUN_--TUN_Y	1.377963	0.261130	5.276919	0.0000
ALG_--ALG_Y	0.416477	0.008488	49.06818	0.0000
KSA_--KSA_Y	0.139877	0.003872	36.12560	0.0000
SYR_--SYR_Y	1.352292	0.042152	32.08159	0.0000
IRQ_--IRQ_Y	0.792702	0.146128	5.424712	0.0000
OMN_--OMN_Y	1.267209	0.051916	24.40904	0.0000
QTR_--QTR_Y	0.824539	0.077619	10.62284	0.0000
KWT_--KWT_Y	0.502054	0.010993	45.67040	0.0000
LEB_--LEB_Y	1.832801	0.245218	7.474182	0.0000
EGP_--EGP_Y	0.368028	0.051878	7.094154	0.0000
LBY_--LBY_Y	0.889726	0.028374	31.35758	0.0000
MOR_--MOR_Y	0.700843	0.040174	17.44528	0.0000
YEM_--YEM_Y	2.387792	0.042368	56.35897	0.0000

Weighted Statistics

R-squared	0.955648	Mean dependent var	47737.55
Adjusted R-squared	0.950685	S.D. dependent var	38546.55
S.E. of regression	8560.010	Sum squared resid	1.05E+10
F-statistic	192.5739	Durbin-Watson stat	1.083742
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.774624	Mean dependent var	30404.30
Adjusted R-squared	0.749407	S.D. dependent var	17440.76
S.E. of regression	8730.719	Sum squared resid	1.09E+10
Durbin-Watson stat	0.867625		

Annex 6. J-test GLS-FEM

	GLS					FEM			
Variable	Coefficient	Std. Error	t-Statistic	Prob.		Coefficient	Std. Error	t-Statistic	Prob.
C	-20.67975	6.335508	-3.264103	0.0014					
P1	8.164577	2.931950	2.784692	0.0063	P1	-9.311583	6.092892	-1.528270	0.1291
P2	0.042692	0.042855	0.996197	0.3212	P2	0.034613	0.363248	0.095287	0.9242
Y1	-1.185023	0.331041	-3.579684	0.0005	Y1	0.945395	0.467430	2.022538	0.0454
Y2	-0.060800	0.056151	-1.082789	0.2812	Y2	-0.323206	0.214168	-1.509126	0.1340
D2	0.549262	0.415453	1.322080	0.1888	D2	0.385764	1.56E+13	2.47E-14	1.0000
TCI2	0.061081	0.052169	1.170822	0.2441	TCI2	1.004102	1.98E+13	5.06E-14	1.0000
T4	1.181800	0.123380	9.578528	**0.0000**	T3	1.291961	0.328710	3.930397	**0.0001**
AR(1)	-0.296675	0.090225	-3.288176	0.0013					
R-squared		0.982851					0.981045		

Annex 7. Trade Flows

obs	MUR_T	MOR_T	ALG_T	TUN_T	EGP_T	KSA_T	JOR_T	SYR_T	IRQ_T	LBY_T	LEB_T	OMN_T	YEM_T	BAH_T	KWT_T	QTR_T
99	0	0.6	148.1	4.5	80	304.3	42.2	20.2	0	1.9	20.1	7.6	30.6	3.8	0.5	2.7
000	0	0.3	99	0.4	81.2	294.1	67.7	26.3	0	2.5	18.2	8.7	43	3.5	0.5	6.1
01	0	0.5	26	0.2	80.5	350.9	60.7	25.4	3.9	3	18.7	18.7	39.8	4.6	0.6	5.1
02	0	0.2	124.5	1	110.8	739.2	82.2	24.8	0.1	3.1	13.6	6.6	16.3	3.1	0.7	1.5
03	0.3	0.6	99.4	3.9	164.56	862.6	126.9	28.8	66.3	17	87.8	10.4	4.5	5.2	27.4	10.4
04	0	0.1	167.9	4.5	319.8	666.6	167.5	29	87.9	39.1	134.3	8.6	6.1	9.4	35.8	24.5
05	4.6	0.8	0.7	10.74	448.2	769.7	48.4	638.9	0.3	14.8	32	0.2	10.8	183.1	28.4	11.1
06	0.1	1.1	5.7	14.1	525	800.8	124.1	26	18.7	41.2	153.7	8.3	47.6	19.7	101.2	31.8
07	0.4	1.2	3.3	15.6	547.4	774.1	72.5	59.9	0	26.6	46.5	14.4	2	59.8	53.9	31.1
08	0	2.4	4.9	43.2	511.9	892.1	103.2	94.9	0.1	11.5	49	32.3	66.1	6.1	18.2	35.8

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The Impacts of Crop Diversity in the Production and Economic Development in Bangladesh

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Abstract

The study uses data from 1986 to 2009 about the production of various cereal crops, purposively selected to represent major production trend in Bangladesh before and after introduction of Crop Diversification Program (CDP) in the early 1990's. The paper attempts to identify importance associated with diversified production, based on usage of lands. Bar graphs, pie charts and trend lines are used to represent the trends in production of rice, other cereal crops and yield of crops per acre of land. The yield-land ratio is used to find out the actual growth in production and it is showing upward trends over the years. Per capita agricultural output is shown to get concept about the condition of food security. Here it is clarified that diversification increases the agricultural production as well as helps to grow industries, reduces unemployment, increases the supply of nutrition and protein, import substitution and growth in agricultural GDP thus overall GDP of the country.

Government policies and strategies are discussed related with diversified production and having successful CDP program to achieve production targets.

Keywords: diversity, yield-land ratio, per capita output, merits

1. Introduction

The practical use of crop diversity refers to the method of crop rotation and fallow land planting and harvesting one type of crop on a specific plot of land one year, and another the next, based on difference in a plant's nutrients need. ("Using Wikipedia,", 2011). That is, in simple words, the cropping diversity means the use of same piece of land to produce different kinds of crops in different seasons.

Malthus (1798) described that the food production increases in Arithmetic mean but population grows in Geometric progression. So it is impossible to keep pace with the agricultural production and increasing population.

According to the World Bank report (2011), the annual growth of agricultural production in Bangladesh was 5.4 per cent in 2010 and 4.12 percent in 2009 by using the gross agricultural- value added approach, the annual growth rate for agriculture value added based on content local currency. In contrarily, the annual population growth rate in Bangladesh in 2010 was 1.12 percent and 1.06 in 2009.

With the increased number of population, the use of lands has been increased in multi-dimensional ways such as production, building's, construction of shelter etc. On one side, the population increases, so does the demand for food and other necessities. The availability of lands for production, on the other side, decreases which may lead to food deficit. In order to meet the increasing demand for food, the government has adopted various programs e.g., the green revolution in early sixties but still then the production could not meet the cent per cent demand for our population. As a result, we have to import food items from the rest of the world.

To fulfill the demand for food, the government of Bangladesh puts emphasis on production of cereal crops, specially rice and wheat. But the over-emphasis on such crops leads to the rise in their production but reduces the production of some other cereals such as vegetables, pulses, species etc.

The reduction in production of such crops leads to dependent on the import of these crops. But such kinds of cereals are the very important sources of protein and calorie and also useful for soil nutrients. These types of crops are also very cheap in money value.

Realizing the fact government of Bangladesh had taken crop diversification program (CDP) in early 1990's to increase the production of all cereal crops. This paper aims to illustrate the positive impacts of diversified production in Bangladesh economy. The later part of the paper represents the various merits of diversified production in Bangladesh along with an empirical study. Government agricultural policies as well as policies and strategies of fifth-five year plan are discussed in next section. And finally by mentioning limitations recommendation is made for a successful diversification program in Bangladesh.

2. Literature Review

Several studies have done on the crop diversity of Bangladesh; different researchers have used different methodologies to analyze different aspects of diversified production in Bangladesh. Metzel and Ateng (1993) collected data from 10 thanas representing major geographical and agro-ecological zones in Bangladesh. The paper attempted to identify problems associated with diversified crops based on farmers' views. They used the regression analysis and Simpson index of diversity as well as Rice-sharing index. The study identified several constraints of diversification in Bangladesh, made some suggestions as well analyze the impacts of NGO's efforts and the degree of diversity in Bangladesh.

Mahmud et al., (1994) aimed at outlining the policies and issues of crop diversification that are likely to influence the growth and sustainability of agricultural production in Bangladesh. They concluded that crop diversification needs to be addressed as part of the broader agricultural development strategy.

Rahman (2004) used the Probit model to analyze the impact of diversified production in Bangladesh. In his study he showed that diversification is positively influenced by the developed infrastructure of a region such as education, experience, farm asset ownership, and non-income ownership of a farmer.

Akanda (2010) had taken secondary data to describe the changes in pattern of cropping along with a forecast of area to be allocated among various crops in 2029-30 and proposed a re-distribution considering probable crop failure, water crisis and change in food habit. He emphasized on diversification in production of crops mainly by focusing the alternative use of lands other than rice in order to have changing pattern of food habit and reducing pressure on ground water.

Rahman (2008) investigated the merit of diversified production in Bangladesh where he showed technical efficiency (TE) and technical change (TC) as principle components of productivity growth.

Hoque (2004) made a long discussion about the crop diversification in Bangladesh. He scrutinized the cropping pattern in Bangladesh, the important aspects of diversification and showed overall picture of diversified cropping in Bangladesh.

Barghouti et al., (2004) treated diversification as a differentiated form of agricultural development and recognized its role to spur sustainable growth in the rural sector. They mainly aimed to outline practical ways to adopt diversification activities. Their study focused how diversified production could remove poverty of a country. They made a six point structure which influences the diversification such as 1) feasibility, 2) policy, 3) infrastructure and markets, 4) research, extension, and training 5) private sector and supply chains, and 6) natural resources. The paper of them closed with the discussion of key investment areas related with this six-point structure to assist diversification thus reduces poverty.

Each of the studies discuss above focused on a particular side of diversification in production but our study analyses the diversification in agricultural production to foster the economic growth by increasing overall production e.g., both agricultural and industrial production.

3. Methodology

This paper is based on secondary data. The sources of the data are Bangladesh Bureau of Statistics, Bangladesh Economic Review and World Bank Report. Here, we use time series data from 1986 to 2009 to analyze the impacts of crop diversity in Bangladesh. We simply make effort to present a descriptive analysis.

3.1 The Crop Diversification Patterns in Bangladesh

The lands of Bangladesh are classified into three categories such as High, Medium and lowlands. High lands or top lands are such kinds of lands that are not flooded, Medium lands are flooded rarely and low lands are flooded frequently. There are diversified productions in all types of lands. The cropping pattern is based on different types of lands which is summarized by the following table:

Land Type	Cropping Pattern
High	1. Boro - T.Aman – Fallow
	2. Potato - Boro (HYV) - T.Aman
	3. Pulses - Jute – Fallow
	4. Wheat - Kaon - T.Aman
	5. Tomato - Aus – Vegetables
Medium	1. Potato - Boro - T.Aman
	2. Wheat - T.Aman – Pulses
	3. Oilseed - Boro - T.Aman
	4. Boro - T.Aman – Mustard
	5. Tomato - Aus – Vegetable
Low	1. Potato - Boro B.Aman
	2. Boro - T.Aman – Fallow
	3. Kaon - T.Aman – Fallow
	4. Wheat - Boro - T.Aman
	5. Jute - T.Aman – Fallow

The forces that led crop diversification are described for each major pattern as follows:

Major Patterns	Forces
i. Potato - Boro (HYV) - T.Aman	a. Irrigation facility
	b. Maximum return
	c. Land suitability
ii. Wheat - Kaon - T.Aman	a. Irrigation facility
	b. Credit facility
	c. Land suitability
iii. Pulses - Aus - Vegetables	a. Improving soil fertility
	b. Balanced diet
	c. Maximum profit
iv. Wheat - Aus - T.Aman	a. Irrigation facilities
	b. Credit facility
	c. Land suitability
v. Boro - T.Aman - Fallow	a. Land suitability
	b. Demand of cereal foods
	c. Improving sol fertility.

Rice, in Bangladesh, is grown throughout the year in three distinct cropping seasons both in irrigated, lowland and upland conditions as follows:

i) Irrigated conditions	1. Potato - Kaon - T.Aman
	2. Boro - T.Aman – Fallow
	3. Wheat - Kaon - T.Aman
	4. Potato - Boro - T.Aman
	5. Tomato - Aus - T.Aman
	6. Pulses - Aus – Fallow
ii) Lowland conditions	1. Wheat - T.Aman – Fallow
	2. Boro - T.Aman – Fallow
	3. Potato - Boro – Aus
	4. Aus - T.Aman – Fallow
	5. Kaon - T.Aman – Fallow
	6. Boro (HYV) - Fallow - Fallow
iii) Upland conditions	1. Mustard - Kaon - T.Aman
	2. Potato - Kaon - T.Aman
	3. Spices - T.Aman – Fallow
	4. Wheat - Vegetable - T.Aman
	5. Pulses - Aus - T.Aman
	6. Wheat - Jute - T.Aman

Source: Ministry of Agriculture

"The upland crops can only survive for a short period if the root zone remains saturated. Most of the CDP crops cannot sustain growth in saturated soils for more than one or two days. Moreover, high rainfall during critical growth stages badly damages the upland crops. With adequate irrigation, most of the uplands can become highly suitable for diversified crops during the dry season and moderately suitable rice fields during the wet seasons. For this, between two main rice crops some selected upland crops are diversified and are grown throughout the year. In a multiple cropping system, farmers are cultivating two vegetable crops either solely (one short or another long duration crop) or mixed/relay cropping. This has only been possible due to good soil conditions, available irrigation facilities and adequate farmers' knowledge about the vegetable crops and marketing facility etc., which led the farmers to follow crop diversification around other crops"

(Haque, 2004, Pattern of Diversification section, 3)

3.2 Overall Conditions of Cereal Crops in Bangladesh

The government had taken Crop Diversification Program in the 1990s. The following table 1 and figure 1 is showing the production of rice and wheat from 1986 to 2009:

Table 1. Total production of rice and wheat from 1986-90 to 2006-09 (thousands MT)

Rice and wheat	1986-1990	1991-1995	1996-2000	2001-2005	2006-2009
Aus	11 467	10 243	8 773	8 906	6 659
Aman	32 015	46 039	45 233	54 431	42 926
Boro	20 739	33 058	44 397	62 582	64 511
Wheat	4 052	6 521	8 374	7 015	3 165

Source: Bangladesh Bureau of Statistics

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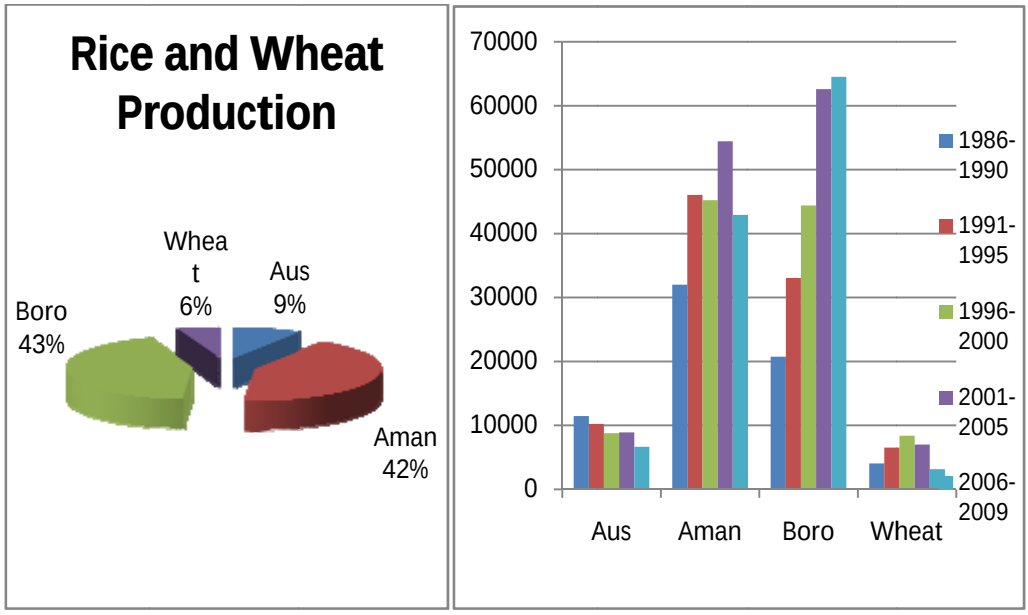

Figure 1. Production of Rice and Wheat from 1986-90 to2006-09

Using total approach we present here the production of rice and wheat in the year of 1986 to 2009.Here, the pie chart shows that the majority of rice production is covered by the Aman, then Boro and Aus , share of wheat production is very small in the pie chart during the period 1986 to 2009.Which implies that rice is the most dominant cereals in Bangladesh. The Bar graph decorated color presents the different rice like Aus, Aman, Boro and also Wheat. Vertical axis of the bar graph represents production of crops and the horizontal axis represents the types of crops. The production of Aus shows decreasing trend within 23 years. Production of Aman has increased from 1986 to 2000 and decreased after 2001. On the other hand, the production of Boro is continuously increasing. The production of wheat has shown a up and down trends. After the diversification program taken in 1990 the production of rice has a stable increasing trends. Wheat production initially increased but after 2000 it began to fall.

The graphical representations of other creal crops with respect to time (using pai chart and bar graph) are discussed below with table-2 and figure 2:

Table 2. Total production of Pulses, Oilseeds, Spices and Potatoes (thousands MT)

Crops	1986-1990	1991-1995	1996-2000	2001-2005	2006-2009
Pulse	2 057	2 623	2 372	1 706	937
Oilseeds	1 758	2 333	2 286	1 428	1 339
Spices	1 210	1 604	1 755	2 662	4 631
Potato	4 500	6 906	10 248	18 358	21 244

Source: Bangladesh Bureau of Statistics

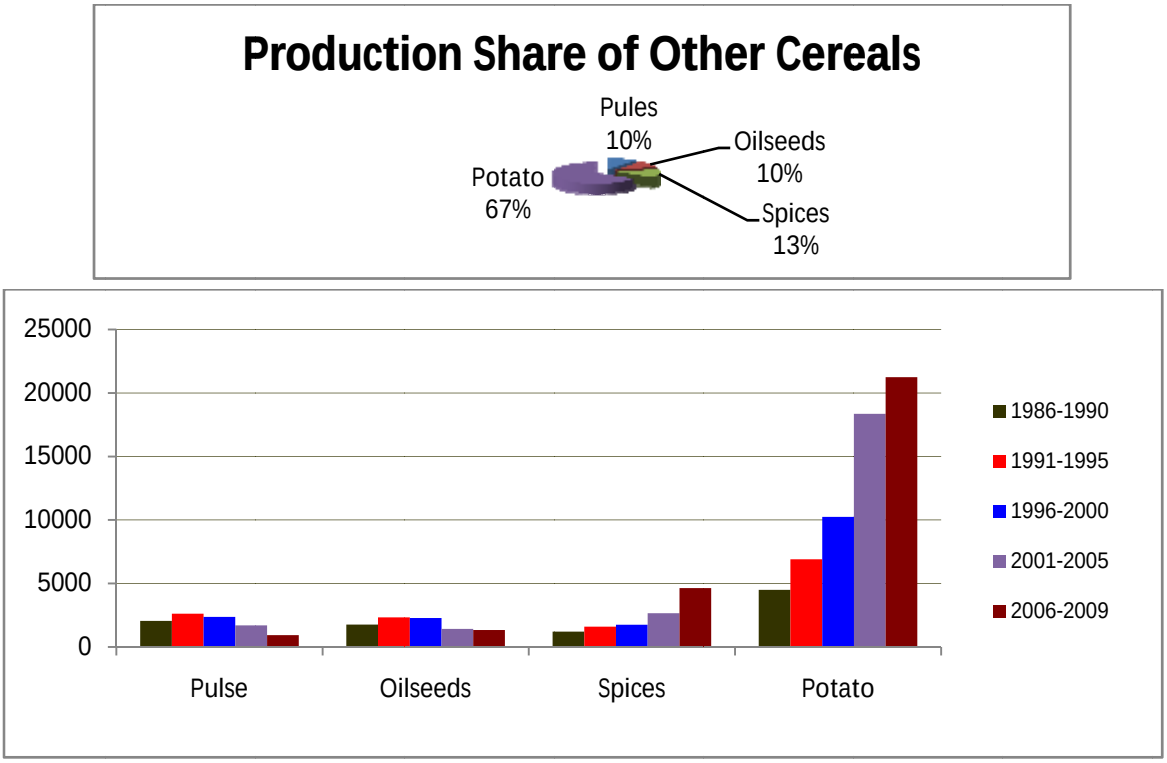

Figure 2. Production of different cereals from 1986-90 to 2006-09

The production of other cereals such as Pulses, Oilseeds, Spices and Potatoes from1986 to 2009 is presented in the pie chart and bar graph. The production of Potatoes increased year after year. From 1986 to 1990 the production of Potatoes was about 5000 metric tons where from 1996 to 2000 it increased to 10,000 metric tons and from 2006 to 2009 it increased above 20,000 metric tons. The productions of Pulses and Oilseeds did not sufficiently increased from 1986 to 1990 and from 1991 to 1995 but decreased between 1996 to 2000 and 2006 to 2009 continuously. Spices, on the other hand, showed increasing trend.

3.3 The Use of Land and Production of Cereals Other Than Rice and Wheat

The following graph represents the picture of production due to implementation of Crop diversity program after 1990, associate data is given in the Table-3:

Table 3. The Use of Lands and Production of Pulses, Oilseeds, Spices and Potatoes

Year	Total Acres (Thousands)	Total Production (Thousands MT)
1989-90	3 895	2 339
1995-96	3 775	2 806
2000-01	3 371	4 273
2005-06	2 903	5 807
2008-09	2 831	6 904

Source: Bangladesh Economic Review-2010

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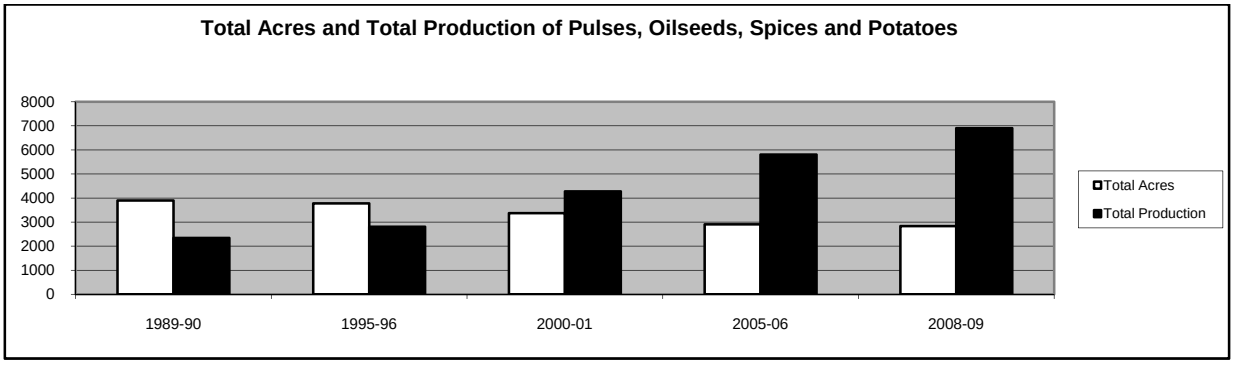

Figure 3. Use of lands and production of minor cereals

The bar graph is representing a true picture of agriculture in Bangladesh. With the time, passing the availability of lands is decreasing which the white bars show and these are becoming smaller. On the other side, the production of lands is showing a upward trend as the production bar graphs are becoming taller. This increasing trend may be due to several factors such as introduction of new production methods but the role of diversified production has also played an important role in the rise in production of such items, even though the acres of lands reduced, mainly because of high population growth.

3.4 Yield Per Acre of Land

The output-land ratio or yield-land ratio (which measures the productivity of land) is equal to the level of production divided by the use of lands in acres. Here, the trend line represents the yield-land ratio from 1989-90 to 2008-09 as follows (with Table-4 and 5) and figure-4 and 5:

Table 4. The production of rice and wheat per acre of land

Year	Total land (Thousand Acres)	Total production (Thousand Metric Tons)	Yield-Land ratio
1989-90	27 277	18 754	0.687539
1995-96	26 299	19 056	0.72459
2000-01	28 588	26 758	0.935987
2005-06	27 202	27 265	1.002316
2008-09	28 847	32 166	1.115055

Source: Bangladesh Bureau of Statistics.

Table 5. The production of other cereals per acre of Land

Year	Total Land (Thousand Acres)	Total production (Thousand Metric Tons)	Yield-land ratio
1989-90	3 895	2 339	0.600513
1995-96	3 775	2 806	0.743311
2000-01	3 371	4 273	1.267576
2005-06	2 903	5 807	2.000344
2008-09	2 831	6 904	2.438714

Source: Bangladesh Economic Review-2009

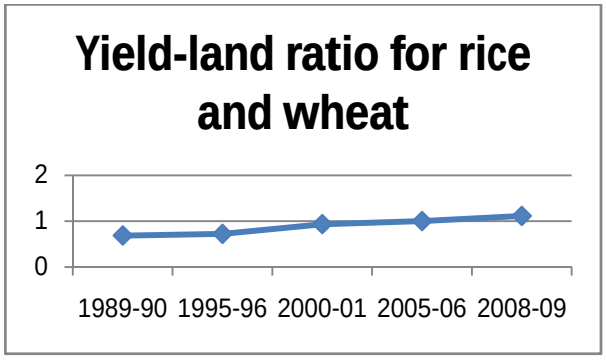

Figure 4. The trend in Yield-land ratio for rice,wheat

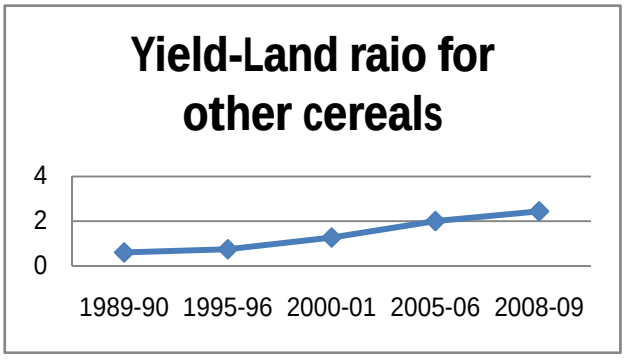

Figure 5. The trend in Yield-land ratio for other cereals

It is clearly visible that, both trend lines are upward slopping, that is the output per acre of land has increased in both cases. The output per acre of land use in rice and wheat production represents quite stable trend. On the other hand, the yield-land ratio for other cereals has represented varying rising trends. After FY 1995-96 this ratio representing a sharp rising trend in compare to 1989-90 till 1995-96 it is mainly due to the successful diversification in cropping.

3.5 Per Capita Cereals Products

Per capita cereal food is used here to distinguish the food security situation before and after diversification in cropping has taken in practice, the trend is shown by the following table-6 and figure 6:

Table 6. The per capita cereal (rice, wheat, pulses, oilseeds, spices and potato)

Year	Total agricultural production (Thousand Metric tons)	Population(Thousand)	Per capita cereal
1990	21 093	1 05 256	0.200397
1995	21 862	1 17 487	0.18608
2000	31 031	1 29 592	0.239452
2005	33 072	1 40 588	0.235241
2009	39 070	1 48 692	0.262758

Source: UN estimation Report, Bangladesh Bureau of Statistics.

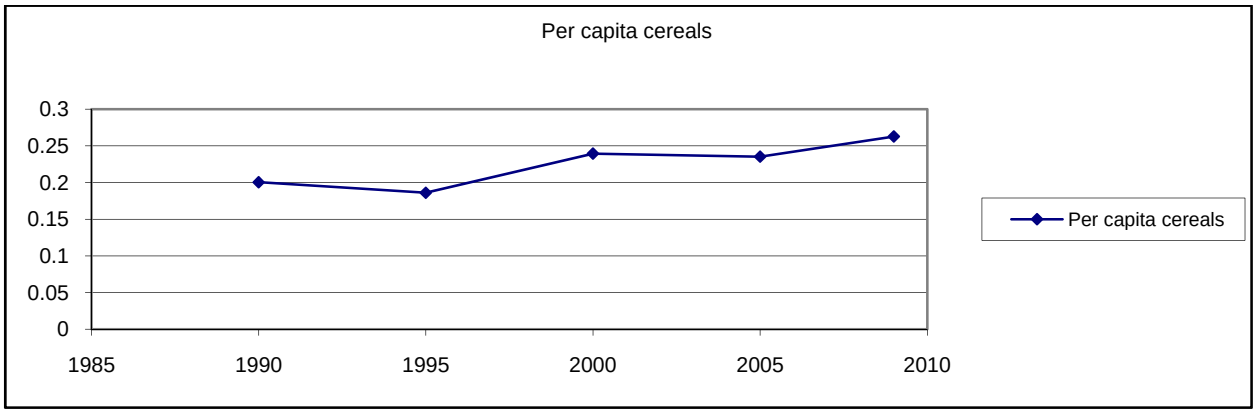

Figure 6. Per capita cereal food

Here, we can see that, per capita cereal was 0.2 Metric tons in 1990, it has fallen down in 1995 and became below 0.19 mainly because of several natural and political disorders. But after that there was an increasing trend till 2000. There was a small lap in 2005, after 2005 to 2009 the line is upward i.e., the per capita output increases which may help to achieve food security. And crop diversification has a positive impact in this respect.

4. Merits of Diversified Production in Bangladesh

In our point of view, the diversified cropping is important for the followings:

4.1 Controlling Seasonal and Disguised Unemployment

The nature of agriculture in Bangladesh leads to create seasonal unemployment because the cropping pattern in Bangladesh is based on seasons. After cultivating once, a piece of land is kept fallow. As a result, the farmers or workers in that particular land remain free, that is why the problem of seasonal unemployment arises. On the other hand, the rate of disguised unemployment is very high in agricultural sector in Bangladesh as many workers are working in less productive sectors. Had there been diversified production along with cropping intensity, then both seasonal and disguised unemployment rates will have been reduced markedly.

4.2 Import Substitution

The introduction of cropping diversity increases the production of both major and minor cereals. As a result, the import of such products has reduced. That means we are now substituting import of cereals by producing them in our own available lands. It is reported by an international organization - Food and Agriculture Organization (FAO) that the import of cereal crops has been reduced in Bangladesh sharply.

4.3 Increasing Land Fertility

It is often said that cultivating the same crop on the same piece of land is not scientific and also not good for the fertility of land, diversification (both in crop and bio) is important for the purpose.

4.4 Meeting the Demand for Protein and Calorie

It is said before that the minor cereals are the cheap and important sources of protein and calorie. If we produce both types of cereals by rotation, then it would provide us with sufficient protein and calorie. diversified production is also important to increase employment of the rural needy people as well as to ensure their solvency.

4.5 Industrialization

Agriculture and industry are closely related and dependent on each other. Industrial raw materials are supplied by the agriculture on the other hand the industrial outputs are necessary for agricultural development. Many economists viewed that both sectors should developed side by side. So by increasing production in agricultural sector has a positive external effect on industrialization. Diversification in agricultural production increases the scope for expansion in industrial sectors because it helps to intensify the production of both sectors.

4.6 Economic Growth

In 2007-08 the contribution of agricultural sectors was accounted 20.83 per cent of total GDP and agricultural items account for about 6.99 per cent of national export earnings. So the growth in agricultural output will help to grow economy rapidly. As the increase in agricultural production helps to get more and more raw materials for industries, so the industrialization would be easy and cost effective. On the other hand import could be substituted by effective industrialization and export could be enhanced through rising both agricultural and industrial production. And there is no alternative of diversified production to foster economic growth through increasing use of limited land resource.

5. Government Policy Measurements and Strategies

Crop diversification is one of the major components of crop production policy. For the overall development of crop sector, special emphasis will be given to crop diversification program under the crop production policy. The government policies in this respect are as follows:

• Area under wheat has meanwhile reached at 0.8 million hectare. Given the potential for expanding wheat acreage, efforts will continue to encourage farmers to grow more wheat.

• The production of maize has shown prospective results in last two years. Maize has also gained popularity as human food side by side with the poultry feed. Public sector procurement of maize has been introduced like rice and wheat in order to encourage farmers in maize cultivation. The efforts for increasing area and production of maize will be strengthened.

• The program for increasing area and production of other crops, e.g., potato, pulses, oil seeds, vegetables, fruits and spices will gradually be extended under the crop diversification program

• Production of different cash crops including jute, cotton will be increased and efforts will be made to expand their multiple uses.

• Special development programs will be taken with a view to increasing production of potential crops suitable for the coastal areas and the hill tracts.

5.1 Fifth Five-Year Plan of Bangladesh Government Regarding Crop Diversity

Sustainability of high yield and environmental protection remain the principal concern in recent years. Loss of soil fertility followed by unbalanced use of chemical fertilizers, lack of adequate quantity of water in some areas as well as

their appropriate conservation and management are the major factors causing divergence between potential and actual output of major agricultural commodities. Various studies indicate that the yield potential of the existing HYVs of rice is more than 4 mt/ha, whereas the average yields of most of the other varieties of rice is around 2 mt/ha. Major tasks during the Fifth Five Year Plan will be to address these issues. The specific objectives of the Plan will be to:

a. increase productivity and real income of farming families in rural areas on a sustainable basis;

b. attain self-sufficiency in food grain production along with increased production of other nutritional crops;

c. encourage export of agricultural commodities, particularly vegetables and fruits keeping in view domestic production and need;

d. promote adoption of modern agricultural practices in dry land, wetland and coastal areas;

e. ensure sustained agricultural growth through more efficient and balanced utilization of land, water and other resources; and

f. encourage comparatively large farm to graduate into commercial farming.

5.2 Policies and Strategies

In order to achieve the objectives, the strategies/policies will be evolved and adopted to bring about necessary technical change. The following will be the specific policies and strategies:

a. improvement of the quality of seeds, particularly HYV and hybrid seeds and increasing their quantity;

b. development of modern, irrigated and least-risk agriculture with greater reliance on competitive markets through supply of agricultural inputs at low cost; making public investment more effective and keeping it limited to key areas as required to supplement private initiatives;

c. strengthening of the agricultural research and extension systems in order to develop new technologies relating to crop varieties, integrated farming system, organic farming, improved agronomic and agro-processing technologies, and for diffusion of the proven technologies;

d. development and dissemination of ecologically sound and sustainable technologies such as integrated pest management (IPM) techniques, and organic and bio-fertiliser use;

e. increasing profitable production of minor crops and thereby maintaining a balanced crop production and improving the nutritional status of the people;

f. development of suitable technologies in rain-fed, dry land and wetland farming system to enhance the productivity;

g. restoration/improvement of soil fertility through better management of the organic matter of soil to improve yields of crops; towards this end, production and use of bio-manure will be encouraged;

h. assistance to small and marginal farmers in forming groups and associations which can (i) enhance production and productivity, (ii) sustain agro-business enterprises on their own, (iii) absorb more credit fund and (iv) adopt/disseminate technologies;

i. participation of NGOs in the agricultural development process;

j. improvement and conservation of plant and genetic resources through collection and conservation of germ plasm;

k. facilitation of access to markets and the promotion of efficient marketing system;

l. formulation of integrated land use policy conducive to optimum use of agricultural resources;

m. implementation of measures to cushion and minimize the damage to agriculture and rural economy brought about by natural calamities;

n. development of the capabilities of rural women and the youth to contribute more to agricultural and rural development;

o. restructuring of the existing institutional set-up to cope with the changed need;

p. development of human resources through education, training and motivation;

q. development and dissemination of appropriate location-specific and cost-reducing production and post-harvest technologies for reduction of post-harvest losses and the removal of transport bottlenecks; and

r. adoption of policies and regulations that will ensure sustainable agricultural development;

6. Limitations and Recommendations

Even though there are lots of policies and strategies present but implementation of such policies is a great challenge for the government of Bangladesh. There is a lot of limitations in our country such as weak infrastructure, poor

transportation facilities, lack of funds, huge bureaucratic behavior, presence of middlemen in agricultural marketing, a strong centralization and low connectivity within the policy makers and the policy takers which make the implementation of any public conducive policy for mass people of our country difficult.

So, to have fruitful policy implication the government of the country should concern to these issues and carefully handle the constraints related with such policies.

7. Conclusion

Bangladesh is an agro-based developing nation where majority of the people directly or indirectly depend of agriculture. In 2009 about 48.6 per cent of total labor force was engaged in agricultural sectors. To increase the production of both major and minor cereals crop diversity has a positive impact. Successful diversification in cropping increase the employment opportunities for the marginal rural people, thus increase the income sources as well as solvency of rural people. The development of a country largely depends on industrialization and diversified production helps industries to grow quickly with providing sufficient raw materials. Several field studies showed that the same piece of land is giving more than ten times yield now compared to what it produced twenty years ago; mainly due to the adoption of diversified production in cultivation. Diversification has a positive link in case of provision of food security, improvement of living standard by increasing income of the population through generation of employment opportunities of the huge population and to improve the balance of trade by increasing exports. So, proper initiatives need to be taken by the government and in personal level in such regard.

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Appendix:

Case Study

Recently, we visited a village at Gazipur and met a school teacher there. We had a long discussion with him. He is a land owner and has few bighas of land and uses them in share cropping with local farmers.

He told us that there are three types of land in his village; low land (which are flooded easily), medium high land (not much flooded), and top land (never flooded). In low land, they can produce single crop. In medium high land, two crops (irri and borro) are produced but in top land, they produce three crops (irri, borro and potato). He said that production is almost the same in having a particular product but top land give extra two yields.

In case of fertility, he said that there is a positive impact of diversification but a gap in cultivation is essential for keeping proper micronutrients in the soil, he added. Later, while sharing his experiences, he said that by the grace of Allah the same piece of land is giving more than ten times yield now compared to what it produced twenty years ago.

Establishing the Relationship between Trademark Valuation and Firm Performance: Evidence from Iran

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Abstract

Valuing intangible assets is a critical issue in modern economics; one of the most important ones is trademarks. In a competitive business environment trademarks can protect and create an advantage for firms. In today's complex and ever faster growing market, a suitable trademark affects firm performance and it is considered as a fundamental economic asset for organizations. Valuing intangible assets and determining its relation with performance indicators has two main benefits, first it can be useful for various stakeholders such as stockholders, creditors and employees in assessing firm performance and secondly it can draw standard setter's attention to importance of recognizing and measuring trademarks and other intangible assets in financial statements. The first step in conducting such research is to identify developed and acquired trademarks of listed companies in Tehran Stock Exchange and computing their related value by financial oriented models, then the relationship between trademarks value and accounting performance indicators including net profit (earnings), Return on assets (ROA), Return on Equity (ROE) and Return on sales (ROS) is examined. The results extracted from 2001 to 2011 indicate a significant and direct relationship between mentioned performance indicators and trademarks value.

Keywords: trademarks value, ROA, ROE, ROS, financial oriented models

1. Introduction

Business firms are seeking to increase their market share and reinforce their competitive advantages by creating an ageless image in their customers mind; thus trademarks are not only a factor influencing market value of the firm but they are also a key variable in reaching aeonic success. Due to low protection for intellectual property in emerging markets, trademarks are crucial in such environments (Chin & Tsao, 2005). Valuing intangible assets is the most influential way to persuade managers and standard setters that trademarks can be considered as a shared bridge in different and various financial paths of market finders and accountants (Karen & Gulding, 1999). The value of intangible assets can be expressed in monetary terms so there seems to be a compromise between decision makers, however valuing this asset can be affected by subjective and theoretical factors, anyhow absence of such evaluation cannot extenuate its importance. Clearly unlike stocks and bonds there is no market for rating intangible assets, hence most of the related models are either research or financial based (Kotler & Pfoertsch, 2006). Registering new trademarks leads to increased sales in forthcoming years (Seethamraju, 2000) and it is expected accounting performance indicators such as earnings, ROA and ROE and ROS react to new developed or acquired trademarks. This research seeks to calculate trademarks value using accounting variables and afterwards determine its interaction with performance indicators.

2. Literature

Accounting literature has mainly focused on recognizing and measuring intangible assets however a reliable consensus regarding valuing all the intangible assets is not attained which brings limitations in presenting financial statements. Evidence suggests research and development and promotion expenses along with copyright and trademark possession plays a vital role in valuing and assessing firm performance (Chin & Tsao, 2005). Aaker (1991) believes trademarks are a strategic vehicle in market mechanism solely due to their ability in creating competitive advantages.

Scrutinizing asset structure of mature and big firms implicates where trademarks proportionate value is higher than other assets, differentiation strategy is mostly chosen by the firm. Assets are important in the eyes of mangers and

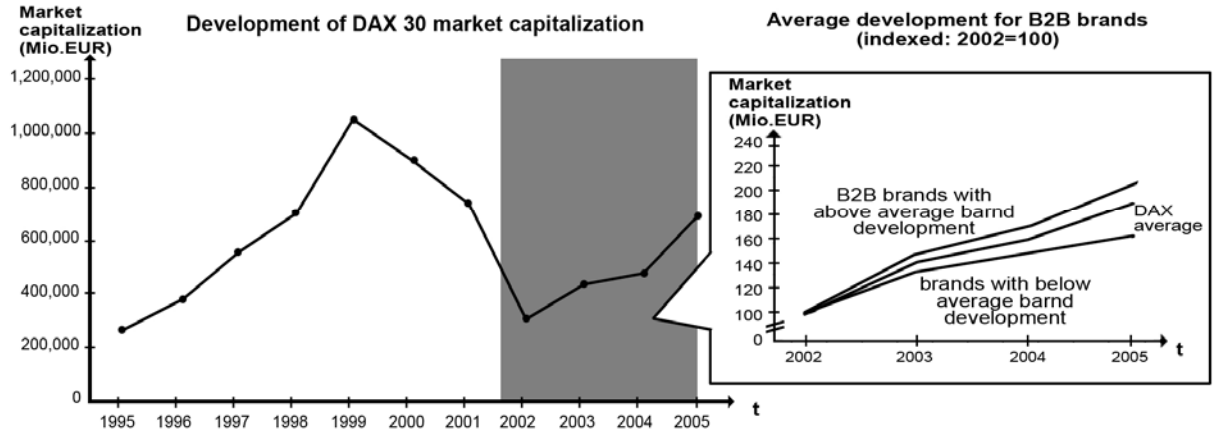
stakeholders simply because they create value, either tangible or intangible (Randle & Leone, 2009). The logic behind measuring the value of trademarks by financial based models (income orientation) does not rely on historical approach; it rather takes the ability of asset in creating future economical benefit into account. Comparing the measurement approaches regarding tangible and intangible assets brightens the importance of future economical benefits (Kotler & Pfoertsch, 2006). Proposing a suitable algorithm for rating trademarks in long-term could be an appropriate performance indicator regarding managers (Simon & Sullivan, 1993), to wit it depicts if managers interests align with investors. Managers can focus on long-term activities which benefit the organization as a whole; consequently this signal affects trademarks value. Barth and Clement (1998) have studied the relations among trademarks value assessed by Financial World magazine, stock prices and returns. This magazine has started trademarks evaluations since 1991 beginning with 41 listed firms, this amount reached 330 in 1996. The results suggest a significant relation between trademarks and owners equity value, they also pointed out trademarks value has straight and positive relation with promotion expenses, operational profit margin and market share of trademarks. Seethamraju (2000) has proposed a model regarding developed or acquired trademarks. He first estimated the value of each trademark and then compared it to Ohlson model valuations (1995); afterwards the relation between market value of equities and their related trademark value was examined. The results demonstrate a significant relation between market values and trademarks. Thus one can claim the necessity for more transparent disclosure of trademarks since it improves financial reporting quality and usage. This research contributes two main benefits to academic literature of intangibles, at first it introduces a new approach in evaluating trademarks valuations and assisting from this phase, the discrepancy between market and book values of intangibles, specifically developed ones, is explained. Kallapur (2004) has assessed the reliability and relevancy of 33 brands asset value recognized by UK firms. They essentially studied the stock price reaction upon a 21 day period after declaration of trademarks value and found a positive and significant relation between stock prices and trademarks value, they also demonstrated a significant relation between market return and brands value in mentioned window. Chin (2005) conducted a research to identify trademarks value in various business cycles. Following Antony and Ramesh (1992) argument, he classified the sample firms into different portfolios of business cycles based on dividend payout ratio, sales growth, capital expenditures and firm age, also Seethamraju's model was used to estimate brands value. They realized as the firm starts fresh and begins to grow and at the end as it reaches slump, the trademarks value decreases uniformly. Ukiwe (2009) has studied the joint effect of brand value and advertising corporate financial performance on stock return; their target was aimed at computer industry, the findings suggest a positive relation between ROA and trademark value. Various researches regarding the role of trademarks in creating value for stockholders have been performed, namely JP Morgan research which indicates that more than one third of firm's value is contributed by trademarks.

Table 1. The role of trademarks in value creation for shareholders

Company Name	Brand value to a billion dollars in 2001	Value than the market value of trademarks	Brand value to a billion dollars in 2002
Coca-Cola	69	51%	69.6
Microsoft	95.1	21%	64.1
IBM	52.8	39%	51.2
GE	42.4	14%	41.3
Intel	32.7	22%	30.9
Nokia	35	51%	30
Disney	32.6	68%	29.3
McDonald's	25.3	71%	26.4
Marlborough	22.1	20%	24.2
Mercedes-Benz	21.7	47%	21

Table 1 depicts the extent to which trademarks can influence economic performance of firms, for instance 71% of Macdonald's overall value is created by its brand or Coca Cola which owes 51% of its value to its well recognized trademark exempting other affiliated brands such as Fanta or Sprite. Nowadays the attention of pioneer firms is shifted towards intangible assets, for example Ford has decreased its tangible assets via investing and acquiring major intangible assets, this company has spent more than 12 billion dollars acquiring Volvo, Jaguar and Land Rover (Lindemann, 2004). The research performed by BBDO consultants (Kotler & Pfoertsch, 2006) in 2006 investigates the impact of brand on firm performance, examining 23 out of 30 firms listed in DAX, those with strong

and well known brands were able to overcome the stagnation occurred after 9/11 pretty faster than firms with no or weak trademark.



Albeit there is no private or governmental institution in Iran which valuates and assesses the trademarks, except for registering these trademarks solely to protect firms and individuals from copyright abuses, accordingly no astonishing domestic research in this area has been conducted.

3. Research Hypotheses

Due to selection of accounting variables in trademark valuation, there are 4 related hypotheses:

H1: there is a significant relationship between trademark value and earnings.

H2: there is a significant relationship between trademark value and ROA.

H3: there is a significant relationship between trademark value and ROE.

H4: there is a significant relationship between trademark value and ROS.

4. Research Methodology

Research methodology in this study is inductive in nature. Using cross-correlation and historical information, the relation between trademark value and performance indicators is examined. In order to do so, two groups of models were used, the first group is a financial oriented model based on income which is responsible for trademark valuation and second group establishes the relation between trademark value and performance indicators. Due to constraint in gathering necessary information used in other models, income based models seem more appropriate for developed brands. Seethamraju (2000) has developed a three stage income based model to valuate trademarks which is used in this research.

4.1 Population and Research Samples

It is anticipated that trademarks play a more important role in food and beverage industry comparing to chemicals and metals, hence the research population consist of food and beverage firms except sugar production industry listed in Tehran Stock Exchange between 2001 and 2011. One of the basic principles in seethamraju's valuation is related to possession of at least one registered trademark in desired period. With this criterion, the number of eligible firm/years reduced to 60. The main variable in computing trademark value is the number of registered trademarks in various years. Audited financial statements and their related notes are the main source of data used in this survey.

4.2 Model Presentation and Variables

Trademark valuation models are generally subcategorized into two main schools of thought, research oriented and financial based. Research models do not consider the financial value regarding brands per se but they rather take consumer behavioral and attitudinal measures into account, meaning these elements are the ones influencing and creating value for trademarks. On the other hand financial based models use accounting and market variables for trademark valuation (Kotler & Pfoertsch, 2006), this approach includes 4 schemas which are expense based, market based, formula based and income based (Karen & Gulding, 1999). Due to limitations in collecting relevant data for desired models it seems appropriate to select income based model for valuing trademarks. Seethamraju's model is

mainly based on Cobb-Douglas Function, an applied economic function which investigates the relationship between production inputs and outputs. The standard Cobb-Douglas shape is only based on labor and capital for production, however to investigate the relationship between other production inputs and the production volume, logarithm production function of Cobb-Douglas is executed in this research.

First step: seethamraju adjusted Cobb-Douglas function in two ways, trademarks were considered as an effective input affecting sales and promotion expenses were used as a control variable. The first step in valuing trademarks is to assess the relationship between sales and the number of brands. In following model, α3 is the measure showing sales change percentage regarding changes in the number of brands.

$$Log\ (SALEt) = \alpha 0 + \alpha 1\ log\ (Ct) + \alpha 2\ log\ (Lt) + \alpha 3\ log\ (TMt) + \alpha 4\ log\ (ADVt) + \varepsilon t \quad (1)$$

- Salest: total sales in year t
- Ct: total fixed assets in year t
- Lt: total labor cost in year t
- TMt: the number of trademarks in year t
- ADVt: advertisement expenses in year t
- Et: model error

Second step: the amount of sales related to trademarks in desired period is computed using α3. By multiplying this figure by the changes in the number of trademarks, the cash flow resulted from new brands is computed.

$$IncSALEt = (\alpha 3 \times SALE_t) \times PCHTM_t \quad (2)$$

- IncSALEt: representing the amount of sales related to trademark,
- SALEt: the amount of sales,
- PCHTMt: changes in the number of trademarks,

Third step: seethamraju believes cash flows resulting from firm brands are stable in nature, thus by discounting them using Gordon model, trademark value is computed. Weighted average of firms cost of capital in specified period is considered as the discount rate.

$$TMV_t = (IncSALE_t \times (TmLevel_t / \Delta TM_t)) / WACC_t \quad (3)$$

- TMVt: trademarks market value,
- IncSALEt: the amount of sales related to trademark,
- TmLevelt: the number of trademarks at the end of period,
- ΔTMt: the number of trademarks developed in desired period,
- WACCt: weighted average of cost of capital,

4.3 Assessing the Relationship between Performance Indicators and Trademarks Value

To answer research hypotheses, linear regression is executed to investigate the interaction between performance measures and trademarks value. The same model is used to test the four research hypotheses however only dependent variables are changed due to each hypothesis.

$$Depended\ variable\ (Net\ income,\ ROA,\ ROE,\ ROS) = \alpha 0 + \alpha 1\ TradeMark\ Value + \varepsilon t \quad (4)$$

4.4 Cobb-Douglas Production Function Results regarding Valuing Trademarks

The coefficient depicting changes in sales regarding the number of trademarks is computed by Cobb-Douglas production function, this coefficient is then used to estimate trademarks value in seethamraju's model. Table 2 shows Fisher test statistic which investigates whether regression model fits the data well, dorbin-watson and kolmogorov-smirnov test results are also demonstrated in this table. The results show that the regression model is appropriate due to significance level and is able to predict 78.1% of changes in sales. Dorbin-watson statistic is 1.711 which points to lack of solidarity between observations; the p-value related to kolmogorov-smirnov test is 83.3% which shows the normality of distribution.

Table 2. Results of Cobb-Douglas model

Model	R	R Square	Adjusted R Square	F	sig	D-W	K-S
Cobb-Douglas production function	0.888	0.788	0.781	113.340	0.000	1.711	0.833

Table 3 shows regression estimations, the last column relates to Variance inflation which tests the collinearity of variables.

Table 3. Regression model parameters

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	1.639	0.194		8.458	0.000		
Fixed assets	0.538	0.045	0.639	11.895	0.000	0.603	1.658
labor cost	0.174	0.053	0.186	3.247	0.002	0.529	1.891
trademarks	0.064	0.032	0.092	2.007	0.047	0.818	1.222
advertisement expenses	0.093	0.025	0.183	3.758	0.000	0.736	1.358

The final regression model is as follow based on results shown in table 4: (the probability regarding interception is 0.000)

$$Log\ (SALE_t) = 1.639 + .538\ log\ (C_t) + .174\ log\ (L_t) + .064\ log\ (TM_t) + .093\ log\ (ADV_t) + \varepsilon_t$$

The trademark coefficient is 0.064, meaning one unit increase in the number of trademarks leads to 0.064 unit increases in dependent variable, sales.

5. Empirical Results

Table 4 is related to regression model fitness, taking F statistics and significance levels into account, the regression model has a desirable significance level and all the research hypotheses are accepted accordingly.

Table 4. Results of test research hypotheses

Model	R	R Square	Adjusted R Square	F	Sig	D-W	K-S	Accept or reject the hypothesis
H1	0.438	0.192	0.178	13.8	0.000	2.131	0.087	Accept
H2	0.484	0.235	0.221	17.78	0.000	2.032	0.798	Accept
H3	0.304	0.093	0.077	5.99	0.018	2.176	0.268	Accept
H4	0.447	0.199	0.186	14.44	0.000	1.890	0.056	Accept

The first hypothesis is accepted with 95% confidence level, thus there is a significant relationship between earnings and trademarks value. The results for the second hypothesis show 22.1% coefficient of determination combined with 0.000 significance which leads to rejection of null hypothesis and hence there is significant relationship between trademark value and ROA. Coefficient of determination for the third hypothesis equals to 7.7% which shows 7.7% of changes in ROE is explained by trademark value. Regarding fourth hypothesis, the adjusted coefficient of determination is 18.6% meaning around 19% of changes of dependent variable (ROS) could be explained by independent variable.

6. Conclusion

Intangible assets such as trademarks are considered as one of the fundamental assets of organizations in today's competitive business environment and is it anticipated that they influence firm performance in variety of ways. Valuing trademarks and establishing its relation with performance indicators could be considered as a desirable measure for stakeholders, mean while standard setters could benefit from this while drawing their attention to vital issues such as recognizing and measuring intangibles in financial statements. The main purpose of this study was to assess the relationship between accounting performance indicators and trademarks value. To this end, trademarks were valued using a financial oriented model which is based on income; this train of thought attempts to discount future cash flows resulted from a registered trademark. Afterwards, the relation between accounting performance measures (earnings, ROA, ROS and ROE) and trademark value was investigated by a linear regression model. According to findings in this research, there is a significant relationship between earnings and trademarks value, meaning those firms with higher trademark value were the ones with higher profit. The results show the same

relation regarding other three performance indicators. These findings indicate the importance of intangible assets which are not usually reported on balance sheet, thus it is expected reporting estimated trademarks value on balance sheet facilitates decision making process by investors and leads to an improved assessment of firm performance.

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The Effects of Globalization on U.S. Monetary Policy

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Abstract

This paper analyzes the linkages between the effects of globalization on U.S monetary policy. It states that the effects of globalization on monetary policy may be perceived through its impact on the financial and economic environment in which it is implemented. Thus, international phenomena have significant influences on the domestic economy and on the ability to achieve domestic goals. This topic is empirically of particular interest at least for three main reasons: First, the current economic and financial crisis affects the World's economy. Second, world financial markets are currently experiencing substantial turbulence starting with the "subprime" mortgage crisis in the United States and its prominent propagating role through international financial linkages in all the continents. We will review some problems that international considerations are creating for the U.S. economy over the coming decades, such as the more globally connected a country is, the less flexibility it has with its monetary policy. Third, an alternative to using monetary policy to guide the economy toward meeting its international goals is trade policy designed to affect the level of exports and imports and the inflation rate. Finally, we conclude our study by exploring how to restore international trade balance to the U.S. Economy. So as long as other countries are willing to accept U.S. assets in payment for the goods they produce, the United States will continue to run a trade deficit at the current exchange rate.

Keywords: globalization, monetary policy, inflation, exchange rates, financial markets

JEL Classification: E43, E44, E50, F40

1. Introduction

The twenty-first century saw major changes in the international linkages among countries. National economies are moving toward a single economy and have direct impact on the U.S. economy. Therefore US monetary and fiscal policies have substantial effects on foreign economies and vice versa. The U.S. economy may move toward a growth or recession, consequences will spread over all the continents. Several decades of globalization have impacted the structure of the U.S. economy through changes in patterns of production, employment, trade, and financial flows and global economy. For example, in 1997, Asian countries were forced to devaluate their currencies after banks shut down and unemployment soared. On the Hong Kong market the Heng Seng index dropped nearly a quarter of its value in a 4-day period in October. For months fears rose for worldwide economic depression but fortunately, the crisis did not spread to the rest of the world. Our focus is on important linkages between countries whatever the exchange rate regime. If the United States tightens monetary policy, its interest rates rise and attract capital flow from foreign countries. The dollar appreciates and foreign currencies depreciate. The U.S. appreciation implies a loss in competitiveness because the World demand shifts from U.S. goods to foreign goods particularly from other competitors. As they become more competitive, their output and employment expand. "Financial openness" that we define as the sum of the stocks of external assets and liabilities of foreign direct investment (FDI) and portfolio investment as a percent of GDP, occurred in both industrial and emerging market economies in the second half of the 1990s (Lane and Milesi-Feretti, 2003). Why did these increases in capital movements occur? Capital movements and financial innovations have decreased the cost of holding foreign assets and consequently increased investors' demand for internationally diversified portfolios and the sophisticated vehicles for hedging foreign risk exposure which has reduced the riskiness of a given level of foreign exposure. In the United States, one direct effect of globalization on Federal Reserve operations investigated in this paper has been to increase the time and the attention that policymakers devote to design and to understand the developments in the world trading system and in World Capital.

2. Literature Review and Methodology of the Effects of Exchange Rates

From academic perspective, I may distinguish two main developments of modern monetary theory: First, the microeconomic-based theories of wage/price formation into classical monetary models, and, second, the use of

optimal monetary policy rules to describe and analyze policy. The origins of these developments can be found in the 1970s, but were just fully realized during these last years. Modern monetary theory emphasizes on policy rules for the setting of the interest rate by the central bank. Empirical model statistically estimated and used by Woodford (2003) helped Central banks or interests rates setters. Despite the fact he provided a treatise on the theory of monetary policy specifying that it is all about monetary policy rules, his analysis did not focus on international models or policy issues comparing to Richard Fisher (2006) who presented in his research a relevant case based on the impact of monetary policy on globalization. Strong international aspect of monetary policy was developed by (Taylor (1993)), the Fed, the IMF and Brookings Institutions with the models developed by Levin, Wieland, and Williams (1999)). When the Federal Reserve Bank sets the interest rate, it makes a decision based on the domestic and global current economic conditions within the overall framework of a monetary policy rule. The best canonical example is the Taylor rule, discovered by John B. Taylor (Note 1) of Stanford University (and later undersecretary of the Treasury). Taylor's rule tells the monetary authorities how to set interest rates in response to economic conditions. A general format for a monetary rule is:

$$it = r^* + \pi t + \propto (\ \pi t\ -\ \pi *\ ) + \beta\ (100\ \ \mathrm{X}\ \frac{\left(Yt - {}^{Y*}_{t}\right)}{{}^{Y*}_{t}}\ )$$

*i*t is the prescribed value of the policy interest rate in a given period t. r* is the « natural » rate of interest or the real interest rate we would see if the economy were at the natural rate of unemployment corresponding to potential GDP $Y_t{}^*$or $\pi *$ is the Fed's target inflation rate. If $\propto$ and β are large, then the monetary policy rule aggressively respond to excess inflation and to economic booms.

In this case, the Federal Reserve will respond much more aggressively than it will respond to the level of economic activity. For example, to hit a 2 percent inflation target at full employment, the Fed would set the nominal interest rate to be 4 percent. If inflation rate is set at 5 percent with a 2 percent inflation while GDP is 1 percent above potential, Taylor's rule would tell the Fed to set the nominal interest rate at 9 percent (2+5+0.5 × [5-2] + 0.5 × 1). Even though the monetary policy rule is very helpful as guidelines for monetary authorities, it is not exactly what they do in decisions making process or it does not represent a complete policy analysis. This approach may have some limitations like many rules. We may disagree about the details of this rule but we have to keep in mind many factors are absent from this rule and may be in the same time relevant for monetary decisions.

Theoretically, exchange rate changes induced by monetary policy shocks in one country would be more likely to elicit monetary policy responses in another country. Mishkin (2007) argues that greater openness to trade should boost the role of the exchange rate as a transmission channel of monetary policy. The larger the share of imports and exports in the economy, the greater the change in net exports--and, hence, in the contribution of net exports to gross domestic product (GDP) growth--for a given change in the exchange rate. In addition, the larger the share of imports in the economy, the larger should be the effect on overall CPI inflation of a given change in import prices when the exchange rate changes. Erceg, Gust, and Lopez-Salido (2010) use a number of calibrated New Keynesian models to analyze the effect of shocks in open economies, and they confirm Mishkin's central hypothesis that economic openness increases the role of the exchange rate and net exports in the monetary transmission process while reducing that of exclusively domestic transmission factors. Cwik, Muller, and Wolters (2008) calibrate a New Keynesian DSGE model to match the performance of the U.S. economy as captured in an estimated VAR model. They also find that, all else equal, greater openness to trade would increase the effect of exchange rate changes on macroeconomic performance. However, Cwik, Muller, and Wolters (2008) show that this effect is attenuated if the pass-through of changes in exchange rates into changes in import prices is limited--the more limited the pass-through, the less that prices of imports in domestic currency respond to exchange rates, and thus the smaller the changes in quantities of exports and imports. Gust and Sheets (2007) also use an open-economy DSGE model to make this finding.

As considerable research points of exchange rate in many countries in recent decades--see, among others, Marazzi, Sheets, and Vigfusson, 2005, Campa and Goldberg, 2005, and Ihrig, Marazzi, and Rothenberg, 2006)-- suggest that even as trade globalization may have been bolstering the exchange rate channel of monetary policy transmission, the decline in exchange rate passthrough may have been acting to reduce it (Mishkin, 2007). Consistent with this, di Mauro, Ruffer, and Burda (2008), in their VAR analysis of the euro area, find a decline in exchange rate pass-through to imports and consumer prices, as well as some evidence that trade (especially in goods) has become less responsive to exchange rates. In fact, Gust, Leduc, and Vigfusson (2006) develop a theoretical model to argue that the simultaneous occurrence of increases in trade openness and declines in pass-through may be no coincidence: increases in trade introduce more foreign competitors into the domestic market, leading to more variable markups over cost and less pass-through of exchange-rate changes into import prices.

Finally, another channel through which globalization might affect the exchange rate channel of monetary transmission might be valuation effects associated with cross-border assets and liabilities. Presumably, as these positions have grown, the valuation and wealth effects associated with exchange rate changes should have grown as well (Lane and Milesi-Ferretti, 2005, Tille, 2008). In practice, however, it is difficult to identify this evolution.

3. The Implications of Globalization on Exchange Rates

Basically, the exchange rate plays three significant roles in international monetary theory. First, its expected change affects relative rates of return from holding dollars versus other major currencies such as Euro, British pounds or yen as capital can move instantaneously in international financial markets to obtain the best return. Second, its level obviously affects the relative price of goods and labor in different countries, affecting exports and imports. And, third, its past and expected rate of change affects inflation through the pass-through mechanism. Despite the fact that globalization puts long-term interest rates under global factors, in a floating exchange rates regimes such as the United States economy, Federal Reserve Bank retain the ability to control short-term interest rates. Formally or informally targeting inflation and other elements, monetary policies in many economies have become more similar in their response to external shocks. In the reality, there is little support for the assertion that financial globalization has increased the responsiveness of exchange rates for major developed economies.

In the meantime, The United States operates in a global economy and that policy today must consider global issues. Global issues restrict the use of monetary and fiscal policy to achieve domestic goals. How fast a country must respond to international pressure depends on the exchange rate regime it follows. If an economy sets fixed exchanges rates, its monetary policy is much more restricted than it is with flexibility exchange rates. The main reason is that the amount of currency stabilization that may be realized with direct intervention is generally small since a country's foreign reserves are limited. If it happens, a country must adjust the economy to the exchange rate to keep its currency fixed by either changing the private supply and demand of its currency, using monetary policy. It means that if monetary policy is being used to achieve exchange rate goals, it cannot be domestically used to achieve domestic goals. If a country uses flexible exchange rates, it has more freedom with its monetary policy, but it must accept whatever happens to its exchange rate, and there are often political forces that do not want to do that. This is the position in which the United States will find itself if foreigners significantly reduce their demand for U.S. assets.

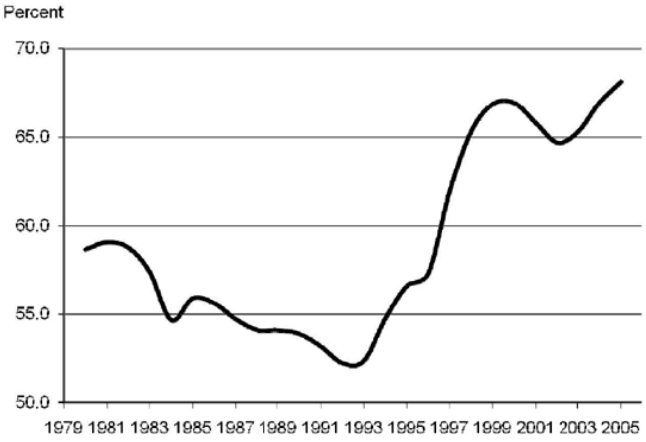

Figure 1. Assets of Globally-Oriented U.S. Banks as a Share of Total U.S. Bank Assets (1980-2006)

Source: Cetorelli and Goldberg (2009)

Whenever market participants buy something that has been made abroad, a car, a stock or a bond, someone somewhere has exchanged dollars for the currency used where the item was made. The exchange rate plays three basic roles in global economy. First of all, the expected exchange rate of the change of the exchange rate affects the return from holding one currency compared to another. A depreciation of US dollars may follow our decision of cutting the interest rate in the United States. The second role played by the exchange rate can be viewed as an impact on exports and imports where a trade deficit will lead to a depreciation of the currency. The last role emphasizes on the percentage change in the exchange rate that affects inflation. As result, the exchange rates have

broad implication for individuals and for countries. As evidenced by a review of the recent history of exchange rates in the midst of economic and financial turmoil in South Korea in 1997/1998 where output and employment plunged. Due to the fact that large industrial and financial industries approached bankruptcy, the number of South Korean won needed to purchase one dollar more than doubled rising from 900 to 1,900. The consequences were dramatic inside South Korea but also in other countries. In 1973, the British pound was worth $2.50. Over the 36 years, its value declined by 35% reaching $1.62. In the meantime, Americans visiting London during summer 2009 found out that they paid more on their purchases as a low-price hotel room in London cost about the same as fairly expensive room in New York. Another example is related to what happened in 2000 in global financial exchange rates markets.

To understand domestic impact from global exchange rates market, let review recent historical evidence. In 2000, the Federal Reserve Bank of New York's foreign exchange rates Office bought Euros for the first time after the new currency was adopted by European countries. Meanwhile, central bank officials in London, Tokyo, Frankfurt, and Ottawa (Canada) did the same by buying between €4 and €6 billion. The Fed alone bought €1.5billion for $1.34 billion. At the end of this operation the ECB press released the information that they did it because of "*shared concern about the potential implications of recent movements in the euro exchange rate for the world economy."* Since its introduction on January 1, 1999, the euro had fallen steadily from $1.18 to $0.85, a decline of more than 25 percent. Though its low value had made exports cheap, bolstering the foreign sales of European-made products, it had also forced up the prices of imports. European Central Bank (ECB) officials, charged with maintaining price stability, found the high price of imports because they really did not want to raise interest rates just to bolster the value of their currency. The coordinated intervention in the foreign exchange market made headlines worldwide. In the same way, Argentina is an interesting case of how external and domestic factors interact in the making of monetary policy. For many years, Argentina has suffered from severe inflation averaging 100 percent during 1970s while the economy grew about 3 percent. By 1989, inflation had climbed to more than 2,000 percent per year and the price level was 60 billion times what it had been 20 years before. To discipline policymakers, in 1991 Argentineans implemented a mechanism called a *currency board*, which had two important factors.

First, Argentina's central bank, the Banco Central of Republica of Argentina, guaranteed that it would exchange Argentinean pesos for U.S. dollars on a one-for-one basis; it fixed its exchange rate. Second the central bank was required to hold dollar assets equal to its domestic currency liabilities, again one-to-one exchange rate. For every peso note that was issued and every peso in commercial bank reserves that it created, the Central Bank of Argentina had to hold one U.S. dollar. These two examples of the European Central Bank and Argentina suggest a relationship between domestic monetary policy and exchange rate policy. To control the inflationary impact of fiscal and monetary policies, Argentina fixed its exchange rate to the dollar. To avoid raising domestic interest rates, the ECB organized a coordinated intervention to shore up the value of euro. Despite the importance of its historical role, economic theory and empirical model show that the change in exchange rates have less significant impact on monetary policy. In my prospective research I expect to look at several factors that determine the inflation rate. International factors may also affect inflation in the United States. Today, markets participants as households, governments, business firms are more concerned about financial conditions around the World. For example, financial markets are influenced by the unrest in Middle East in Africa and other sudden changes or climatic changes in the World. Shocks to food and oil prices caused by extreme weather conditions cause inflation to fluctuate in short run. We may be tempted by concluding that these financial conditions and changes limit the influence of the US monetary policy and directly, the role of Federal Reserve in long run. How all of this affect monetary policy?

4. What Are the Implications of Globalized Financial Markets for Domestic Monetary Policy?

As markets are globalized, the financial environment in which U.S. monetary policy operates is constantly changing due to the importance of financial flows into and out of the United States. Comparing to many years ago when U.S. financial assets were just held by some foreign investors and institutions, today foreign and domestic investors are internationally diversified. For instance, one-quarter of the long-term fixed-income securities issued by U.S. institutions is held by foreigners. In 2006, foreigners acquired on net more than $1.6 trillion in U.S. assets, while U.S. investors purchased more than $1 trillion in foreign assets. Consequently, capital inflows and outflows certainly influence long-term U.S. interest rates and affect the supply and demand of capital investment and saving.

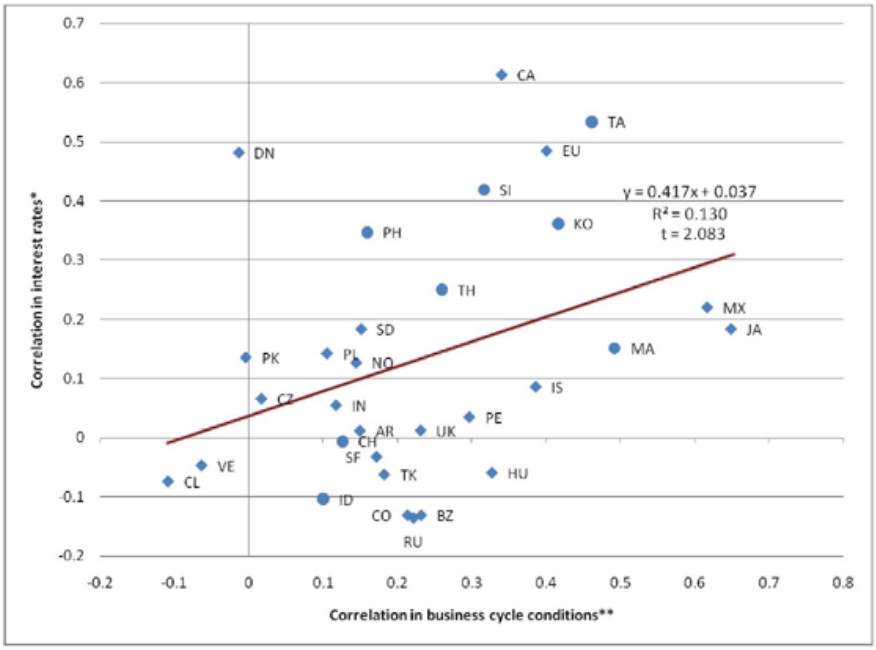

Figure 2. Correlations of Nominal Interest Rates with U.S. vs. Correlations of Business Cycle Conditions with U.S. (January 2000 - December 2007)

Source: Federal Reserve Bank, 2007

The first stages of the monetary policy transmission for monetary policy as summarized in table 1 show that using open-market tools, the Federal Reserve handles money supply in the interbank system. These open-market purchases and sales have also an impact on the Fed's balance sheet. In the meantime, the federal funds rate does not have a straight impact on economic activity but the Federal Reserve's ability to control the federal funds rate gives it a strong influence over other short-term dollar nominal interest rates. If the Fed can set the short term interest rate is because of the nature the dollar. The dollar is a freely floating currency.

Differences in financial structures across nations will determine the effectiveness of monetary policy used by central banks. As markets become global, markets participant's households and business firm face more competition. The U.S. and other countries' economies and globalization led to the complexity of implementing an effective monetary policy and increase Federal Reserve Bank and other central banks responsibility to stabilize prices and output. The implications of global markets on monetary policy are explained by the study of the first steps of the monetary policy transmission mechanism such as federal funds rate, the interest rate at which banks lend to each other or the use of open-market operations and other tools. Another aspect is that global financial markets increase financial interdependence among nations. Correlations can be found between long term interest rates in the United States and other industrial countries for instance German, Canada, the United Kingdom…

Table 1. The Monetary Policy Transmission

Channel	Mechanism
Interest rates (traditional channel)	Lower interest rates reduce the cost of investment, making more projects profitable.
Exchange rates (traditional channel)	Lower interest rates reduce the attractiveness of domestic investment, depressing the value of the currency and increasing net exports.
Bank lending	An easing of monetary policy raises the level of bank reserves and bank deposits, increasing the supply of funds
Firm's balance sheets	Lower interest rates raise firms 'profits, increasing their net worth and reducing the problems of adverse selection and moral hazard.
Household net worth	Lower interest rates raise individual's net worth, improving creditworthiness and allowing them to increase their borrowing.
Asset prices	Higher stock prices and real estate values fuel an increase in both business and household consumption.

Even though financial markets has not reduced the ability of the Federal Reserve to affect financial conditions in the United States, but Federal Reserve Bank has to pay a close attention on that interdependence conditions abroad and in the U.S. including some empirical research which support the view that U.S. monetary policy retains its ability to influence longer-term rates and other asset prices.

5. How Do International Factors Domestically Influence The Determination of U.S Inflation Process?

The Federal Reserve has changed the way in which monetary policy is implemented over many years. In the late 1970s and early 1980s, it set a target level for the money supply and altered the monetary base to achieve that target. In this method the Federal Reserve acted freely through federal funds fluctuations. Today, The Federal Reserve uses the reverse procedure such as setting a target for the federal funds rate and allowing the money supply to fluctuate. A common mistake is to consider that these changes in the Federal Reserve's rules alter the way the money market work. In fact, the money market works the say way as always: the interest rate for example is determined by the supply and the demand for money. It is not set by the Federal Reserve as many argue. The only difference is that the Federal Reserve adjusts the supply of money to achieve its target interest rate. Therefore it is critical to not confuse a change in the Fed's operating procedure as explained in table 2 with a change in the way the economy works.

Table 2. Expansionary monetary policy

Increase Money Supply →	Lower interest rate raises →	Higher investment→ spending (via multiplier)	Higher investment→ consumer	Increase in consumer→ spending	Agregate aggregate demand and AD curve shifts to the right

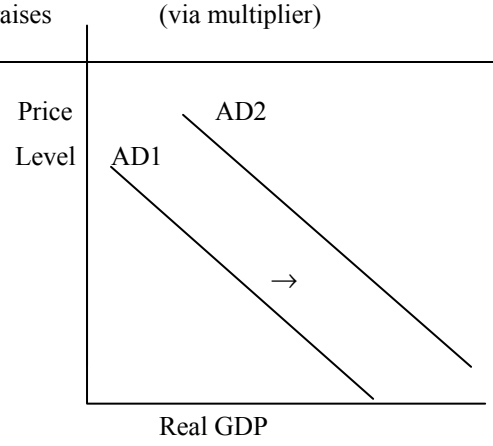

Table 2 shows the adoption of expansionary monetary policy by the Fed, and an increase of monetary supply. Interest rates fall leading to higher investment spending, which raises income, which, in turn, raises consumer spending shifts the AD curve to the right.

Table 3. Contractionary monetary policy

Decrease Money Supply →	Higher interest rate →	Lower investment→ spending reduces	Lower consumer → spending (via multiplier)	Decrease in aggregate demand and AD curve shifts to the left

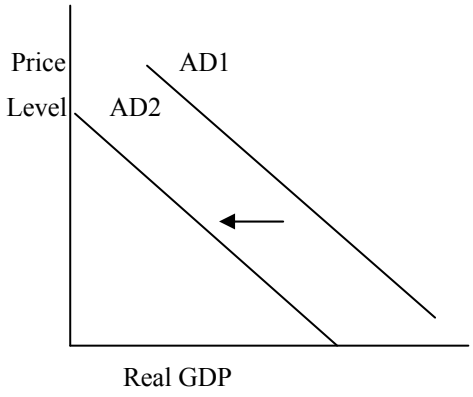

Table 3 shows the adoption of contractionary monetary policy by the Fed , and a decrease of monetary supply. Interest rates rise, leading to lower investment spending and a reduction in income. This lowers consumer spending and a reduction in income. This lowers consumer spending and shifts the AD curve to the left.

Currently, monetary policy is quite similar among developed nations. Each major nation has a central bank including the Eurozone. All the central banks want to keep the aggregate price level roughly stable or around 2% or 3% per year. As we stated above, if we look at the label of a shirt, chances are it was imported from China, India, or somewhere else in Asia. The reason is that it is less costly to manufacture clothing in places where labor is inexpensive. Consequently, clothes are cheaper in the Unites States: trade lowers prices, but if trade lowers prices in the U.S, does it lower inflation?

The simplest way to understand the effects of international trade on the U.S. inflation rate is to analyze it as a source of productivity enhancing technological progress. Shifting production clothes from domestic factories to foreign ones is the same as U.S. producers finding a new, cheaper technology for producing the same things at home. And improvements in technology increase potential output. An increase in potential output shifts both the long-run and short-run aggregate supply curves to the right.

The immediate impact of shifting the economy along its dynamic aggregate demand curve to a point where output is higher and inflation is lower. Thus, globalization and trade do reduce inflation in the short run and just like any positive supply shock they provide an opportunity to reduce inflation permanently. In 1990s, Federal Reserve policymakers took advantage of an increase in potential output to drive the U.S.inflation rate down from 5 percent at the end of the 1990-91 recession to 1 ½ in 1998. This drop in inflation occurred during an economic boom. Over the last half of the 1990s economic growth averaged 11/2 percentage points above the rate for the preceding 20 years. That is, U.S. productivity (and potential output) grew more rapidly from 1996 to 1999 than it did from 1975 to 1995. In effect, the Federal Reserve took the opportunity to reduce their implicit inflation target from near 5 percent to below 2 percent (disinflation). During the 1990s, Fed policymakers exploited the opportunity afforded them by positive supply shocks to permanently lower inflation. Globalization cause inflation to depend on the prices of imported goods because of the competition between domestic products and products made abroad. The pricing power of suppliers or business firms are affected and consequently, the productivity growth. As markets become global and integrated markets participants who supply goods, services and labor may face more competition because prices and wages can be determined by both local and foreign markets. Open- economies are interdependent and gain from trade.

With the development of high technology and internet, it is easier to order and to use goods and services made overseas. In individual perspective, from drinking a juice made from oranges grown in Florida, hot chocolate from beans grown in Ivory Coast, watching a news broadcast from Los Angeles on a television made in Japan to wearing clothes made in China and driving a car made of parts manufactured in several countries around the world, we all are active participants of international trade system. In global business perspective, transactions are not only limited to goods and services, but also involve investing such as buying and selling bonds, stocks in global financial markets. Obviously in short run, international trade and globalization affect domestic inflation and just like any positive supply shocks they provide an opportunity to reduce inflation permanently. While a better understanding of implications of globalization will help us to understand inflation dynamics, it is clear that international factors may have an impact on domestic inflation through several channels: prices of imported goods, productivity growth, pressures on resource utilization in foreign countries. Those factors will be explored in my research as research associate.

5.1 The Impact of Imported Goods

An important part of any of us spends on imported goods pays for the costs of domestic transportation and the retail store where we shop. The amount of this domestic content of imported goods varies substantially with toys and clothing having as much as 90 percent and automobiles as little as 10 percent. Another point is that an alternative to using monetary policy to guide the economy toward meetings its international goals is trade policy designed to affect **the level of exports and imports.** Specific use of tariffs and quotas is limited by international conventions, but indirect policies to affect imports and exports are often implemented. For example, U.S. tax laws can be designed to make it more costly for companies to produce abroad. Implicit subsidies can be given for exports and implicit constraints can be placed on imports. We can expect such programs to continue and to expand in the coming decade as the United States attempts to reduce its trade deficit by means other than a fall in the exchange rate of the dollar, which is the alternative path to reducing its trade deficit.

Empirical research shows that international transactions or trade with developing countries decreased the rate of growth of import prices from 1/2 to 2 percentage points in developed countries. Between 1993 and 2002, trade with China reduced annual import price inflation in The United States by 1percentage point (Kamin, Marazzi, and Schlinder, 2006) (Note 2). Another research form the International Monetary Funds shows that the prices of domestic products were restrained by competition from imports (IMF, 2006). When Ben S. Bernanke was sworn in as the 14th chairman of the Board of Governors of the Federal Reserve System, he said: *"Our mission, as set forth by the Congress, is a critical one: to preserve price stability, to foster maximum sustainable growth in output and employment, and to promote a stable and efficient financial system that serves all Americans well and fairly."* (Note 3) Greater openness to trade increases the influence of imports prices on domestic inflation. The greater openness of the U.S. economy and the impact of global economies leave the United States more open to international influences. In one hand, a more open economy can be more forgiving as excesses in demand are absorbed by other countries through adjustments of our imports and exports. Thus the United States may draw up world capacity; the

inflationary effect of an increase in aggregate demand might be damped for a time. By early 2010, the Fed had presented the public with considerable detail about the tools that it would use-"at the appropriate time"- to tighten monetary policy and exit from the unconventional policies that it had implemented during the financial crisis of 2007-2009. The large size and unusual composition of the Fed's post-crisis balance sheet meant that the procedures for tightening would be different than in normal periods. By raising interest rate that it pays on reserves, the Fed is able to tighten policy without shrinking its balance sheet. When the Fed tightens see if you can detect the shift by examining its assets and liabilities, which are reported each week in Federal Reserve Statistical Release. The United States is also subject to inflationary forces from other countries including those that might accompany a shift to a more sustainable pattern of global spending and production. In the global economy with separate currencies that can fluctuate against each other over time, each country central bank determines its inflation rate. If the FOMC allows the U.S. economy to run beyond its sustainable potential, inflation would rise. If the influence of globalization on inflation is as substantial as many claim, we might have expected the standard model to have had difficulty in predicting recent inflation trends. For instance, if recent increases in world labor supply are restraining domestic unit labor costs to a significant degree, or if there are other important influences on inflation that are related to globalization but difficult to quantify in the context of the standard model, we would expect to have seen sizable model errors over the past several years. An empirical research used out-of-sample dynamic simulations of a model for core PCE price inflation estimated from 1985 through the end of 2001, we find that although the model over predicts inflation over the past several years, the errors average only 0.1 to 0.2 of a percentage point per year. What do I claim from all this evidence is that the greater integration of U.S. economy into a rapidly evolving world economy has affected the dynamics of inflation determination.

5.2 How to Restore International Trade Balance to the U.S. Economy?

The theory of comparative advantage provides the long-run setting within which short-run policy is conducted. As long as other countries are willing and able to accept U.S. currency or U.S. assets in payment for the goods that they produce, the United States may continue to run a trade deficit at the current exchange rate. At some point, foreigners will stop to accumulate more U.S.currency or assets. When this happens, under the assumption of nothing else changes, the dollar will depreciate until the United States regains comparative advantage in enough goods and services to create a balance of payments without inflow of foreign financial assets. This point leads our discussion to the competitiveness of the ability of a country to sell its goods to other countries. This suggests that globalization pressures on U.S. macro policy will keep U.S. growth slower than what it otherwise would be, and place continual downward pressure on US wages for workers producing an expanding number of tradable goods. Also, differences in financial structure across countries may help explain differences in the effectiveness of monetary policy. Consequently, changes in the structure of financial system will affect monetary policy. One of the primary channels through which monetary policy influences real output and inflation is its impact on the supply of bank loans. By influencing bank lending, policy makers can affect the ease with which individuals and business firms obtain financing.

6. Conclusion

Globalization has not empirically affected the ability of the Federal Reserve Bank to influence financial environment in the United States neither preventing monetary policymakers to achieve their goals, but they have to consider a diverse set of global influences because globalization complicates monetary policy for two main reasons: inflation as one of the key macroeconomic topic is increasingly subject to international forces. It means that coordinated global policy between central banks is critical to all the economies such as with the European Union.

Second, Globalization complicates the impact of monetary policy on long-term rates. The Fed faces a challenge by changing short term rates because it has a strong influence on the long term rates such as Mortgages and commercial loans. Over the past several decades, interest rates across the global economy have come to move ever more closely with each other. Prior empirical research has not been able to conclusively tie these increased co-movements to increased financial market integration, as other trends appear to be complicating the analysis, most notably a tighter anchoring of inflation expectations that appears to be diminishing the response of yields to all sorts of shocks, domestic and external. However, taking all of the evidence and prior research into consideration, our judgment is that the trend toward heightened correlations in interest rates across countries very likely reflects financial globalization, particularly as there is little evidence that business cycles have become more internationally synchronized.Even so, globalization appears to be amplifying the role of international considerations in the formation of domestic monetary policy. First, it is clear that even with floating rates, the short-term rates set by monetary policymakers in many economies are responding to foreign financial conditions, and apparently to a greater extent than previously. This could be because globalization is rendering exchange rates more sensitive to interest rate differentials, and even central banks with floating currencies will need to respond to changes in

exchange rates. It could also be because exchange rates are becoming a more important channel of monetary transmission. A final explanation for the increased co-movement in short rates observed across economies is that monetary policy strategies around the world are becoming more similar with the adoption of inflation targeting and other elements of good practice in central banking.

In addition to short rates, long-term interest rates appear increasingly to be affected by international developments as well. This poses a challenge to central bank policymakers, who must not only understand the implications of, and formulate a response to, domestic shocks, but must also take into account a diverse array of external shocks. In a speech a few years ago, Federal Reserve Board Chairman Ben Bernanke noted that although globalization has not "materially affected the ability of the Federal Reserve to influence financial conditions in the United States, nor has it led to significant changes in the process that determines the U.S. inflation rate...effective monetary policy making now requires taking into account a diverse set of global influences, many of which are not fully understood" (Bernanke, 2007a).

Finally, the recent crisis has both underscored the challenges of monetary policy in a globalized financial system and highlighted the importance of liquidity and credit channels as additional conduits of external shocks. The crisis has also identified an area in which the standard array of central bank tools may have become inadequate in many countries: liquidity provision and the lender-of-last resort function. With the rise in the share of financial transactions undertaken in vehicle currencies such as dollars and Euros, the ability to print domestic currency may no longer suffice to address a liquidity crisis. Accordingly, international arrangements for liquidity provision may become increasingly important in the future.

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Notes

Note 1. John B. Taylor, "Discretion versus Policy Rules in Practice," Carnegie-Rochester Conference Series on Public Policv, 1993. For a good discussion, see John P. Judd and Glenn D. Rudebusch, "Taylor's Rule and the Fed: 1970-1997," Federal Reserve Bank of San Francisco Review, 1998.

Note 3. The share of imports coming from China is relatively high for the United States, and so the effect of trade with China may be lower for industrialized countries. For example, one analysis of trade between the United Kingdom and both China and India found that, over the period 1999-2002, the effect on import-price inflation was only about 0.5 percentage point annually (Nickell, 2005). Research by the European Central Bank, however, found that Euro area's trade with a wide range of developing economies had reduced the rate of increase in import prices to the area wide range of developing points annually over 1996-2005 (European Central Bank, 2006).

Note 3. Remarks by Chairman Ben S. Bernanke at the ceremonial swearing-in by President George W. Bush, Federal Reserve Board of Governors, Washington, D.C., February 6, 2006.

Oil Prices and the Real Exchange Rate in Nigeria

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Abstract

This paper has investigated the relationship between the real oil prices and the Real Exchange Rate. Using time series data covering the period between 1980 and 2010, the result of the Johansen cointegration test suggests a long run equilibrium relationship between the real oil prices and the Real Exchange Rate. This relationship was supported by the Granger Causality test which validated the causal relationship from the real oil prices to the Real Exchange Rate. The result from the Generalized Autoregressive Conditional Heteroskedasticity test suggests persistence of the volatility between the real oil prices and the Real Effective Exchange Rate. The implication of this is that government policies in tackling the impact of fluctuations in real oil prices are important source of stabilizing the movements in the Real Effective Exchange Rate. The Nigerian government should consider this important relationship when formulating and implementing economic policies.

Keywords: real exchange rate, real oil pries, vector error correction, the Nigerian economy

1. Introduction

The Real Exchange Rate (RER) is a significant factor in the development process of an economy as both its level and stability are important in increasing exports and private investment. Globally, the price of oil has been a significant determinant of the level of economic performance. The magnitude of the direct effect of a given oil price increase depends on the share of the cost of oil in national income, the degree of dependence on imported oil and the ability of end-users to reduce their consumption and switch away from oil (Marzieh, 2006). Since oil is the main stay of the Nigerian economy, the price of oil plays a vital role in shaping the economic well being of the country. The price of oil has witnessed signifincat fluctuations since 1974. For instance, it oscillated between $17 per barrel and $26 at different times in 2002 and about $53 per barrel by October 2004 (Philip and Akintaye, 2006). Between 2000 and 2008, oil prices increased more than 6 folds from $23 per barrel in January 2000 to a peak at an all time high at $146 per barrel in July 2008 before crashing to $42 per barrel by December of 2008. for the year 2009, oil price averaged $61.73 per barrel (Hassan and Zamid, 2011). The price of oil has continued to trend upward as result of the political crisis in the Middle East, particularly, the revolutions in some Arab countries including Tunisia, Egypt, Libya, Yemen and Syria as well as the Iranian nuclear crisis which led to a ban of the import of Iranian oil by U.S.A and European countries and threats of repercussion from Iran.

The transmission mechanism through which oil prices influence the RER include both supply and demand channels. The supply side effects are related to the fact that crude oil is a basic input in production and consequently, an increase in oil price leads to a rise in the cost of production of non-tradable goods. The price of non-tradable goods will thus increase leading to an appreciation of the RER. The RER is also indirectly affected through its relation with disposable income. A rise in oil price reduces the consumers spending power. This will reduce the demand for non-tradables and therefore to a fall in their prices. This will depreciate the RER. The Nigerian oil sector can be categorized into three segments- upstream, downstream and gas. However, the downstream sector provided the most challenge. The incessant crisis in supply of petroleum products culminated in the government's decision to deregulate the downstream sub-sector. Oil production by the Joint Venture companies accounts for about 95% of Nigeria's crude oil production. Shell which operates the largest joint venture with 55% government interest, through the Nigerian National Petroleum Corporation, NNPC) produces about 50% of Nigeria's crude oil, Exxon Mobil, Chevron Texaco, ENI.AGIP and Totalfinal Elf operated the other Joint Ventures (Gbadebo, 2007).

Lots of empirical studies have been carried out on oil prices and the RER in the developed countries (Clarida and Gali, 1995, Chaudhuri and Daniel, 1998, Chen and Chen, 2007, Spatafora and Stavrev, 2003, Bjornland and

Hungnes, 2008, Akram, 2004 and Habib and Kalamova, 2007).However, only few studies have been carried out on oil and RER (Ozsoz and Akinkunmi, 2011 and Hassan and Zahid, 2011) in developing countries including Nigeria. Thus despite the general recognition that oil plays an important role in the Nigerian economy, little research exists on the effects of oil prices on the RER. Thus a study that investigates oil prices and RER will have direct relevance for policy purpose. The study will shed new light and add to what is already known regarding this relationship in the less developed countries and Nigeria in particular.

The Nigerian economy is exposed to oil price shocks since oil contributes over 90% of the total revenue. This shock is so severe that the Nigerian budget is even tied to a particular price of crude oil and the budget was adjusted in some occasions when there is a sudden change in crude oil price such as the reduction of budget due to a fall in oil prices during the las global financial crisis. This is even worsened due to the fact that despite the four refineries, Nigeria is still exposed to oil price shocks due to massive importation of refined petroleum products. As an oil exporter and importer of refined products, Nigeria is thus vulnerable to oil price volatility. The main purpose of this paper is thus to examine empirically how the RER in Nigeria responds to volatility in oil prices. A Vector Error Correction and Variance decomposition models of the Nigerian economy will be estimated for this study. Other than this introductory section, the rest of the paper is divided into four sections. The second section is on the theoretical underpinnings and the third section is on the review of relevant empirical literatures. The statistical procedures form the fourth section and the fifth section concludes this paper.

2. Theoretical Underpinnings

The theoretical framework is based on Chen and Chen (2007). Suppose that the home and foreign country consumer price indices be as follows:

$$CP_n = (P^t)^a(P_n)^{1-a}$$

$$\Rightarrow P_t = \log (CP_n) = \alpha\log(P^t) + (1 - \alpha)\log(P^n) \quad (1)$$

$$\Rightarrow P_t = \alpha P^t{}_1 + (1 - \alpha)P^n{}_t$$

$$CP_f = (P^{t*})^{\alpha*}(P^{n*})^{1-\alpha}$$

$$\Rightarrow P_t^* = \log (CP_f) = \alpha^*\log(P^{t*}) + (1 - \alpha^*)\log(P^n{}_t) \quad (2)$$

$$\Rightarrow P_t^* = \alpha + P_1{}^{t*} + (1 - \alpha)\, P_1{}^{n*}$$

Where $P_1{}^t(P_1{}^{t*})$ and $P_1{}^n(P_1{}^{n*})$ are prices of traded and non-traded goods in the home (foreign) country, while CP_n and CP_f are home and foreign consumer price indices, respectively. α and α* weights correspond to the expenditure shares on traded goods near the point of approximation for the home and foreign countries. The log of the exchange rate, is defined as:

$$q_r = \frac{P^*}{P} q_n$$

$$\Rightarrow \log (q_r) = \log(q_n) + \log (P^*) - \log (p) \quad (3)$$

$$\Rightarrow lq_r = lq_n + P_t^* - P_t$$

Where q_r and q_n are real and nominal exchange rates, respectively. Thus, from (1), (2) and (3), the real exchange rate can be written as:

$$lq_r = (lq_n + P_1{}^{t*} + P_1{}^t) + (1 - \alpha)(P_t^t - P_t^n) - (1 - a^*)(P_t^{t*} - P_t^{n*}) \quad (4)$$

According to (4), if $\alpha \cong \alpha^*$ a rise in the relative price of domestic tradables, depreciates the RER, while the magnitude of the rise exceeds that of the rise in the relative price of foreign tradables. That is, if the home country is more dependent on imported oil, a real oil ice rise may increase the prices of tradable goods in the home country by a greater proportion than in the foreign country, and thereby cause a real depreciation of the home currency. Moreover, in order to improve competitiveness when an oil price shock worsens the term of trade, the home country would have to raise the nominal exchange rate, which would lead to a further real depreciation.

3. Empirical Literature

Clarida and Gali (1994) assessed the sources of RER fluctuations using Blanchard-Quah identification strategy in US-Canada, US-Germany, US-Japan and US-UK RER data from the third quarter in 1974 to the fourth quarter of

1992. their study showed that real shocks account for more than 50 percent of the variance of RER. Chaudhuri and Daniel (1998) in their study of long run equilibrium RER for 16 OECD countries and found that the non-stationary behaviour of US dollar RER is due to the non-stationary behaviour of real oil prices. Cashin, Luis and Sahay (2004) in their study of over 50 countries discovered a long run relationship between exchange rate and the exported commodity price in one third of the sample. Yousefi and Wirjanto (2004) empirically investigated the role of the exchange rate on crude oil price formation among OPEC member countries and the US dollar against other major countries and prices of other members. The results highlighted a cross-regional dimension of the crude oil market. Chen and Chen (2007) investigated the long run relationship between real oil prices and RER by using a monthly panel for G7 countries and then found that real oil prices may have been the dominant source of RER movements and that there is a link between real oil prices and RER. Aziz (2009) in a comparative study between net oil exporters and oil importers found evidence of a statistically significant relationship between oil prices and RER and found no evidence of along run relationship between RER and oil prices. Leili (2010) investigated the long run relationship between real oil prices and RER using monthly panel data of seven countries of OPEC members from 2000 to 2007. The result showed that real oil prices may have been the dominant source of RER movements. The result also showed a long run linkage between real oil prices and the RER. In a study of the long run relationship between real oil prices, Real Effective Exchange Rate (REER) and productivity differentials. Hassan and Zahid (2011) using annual data for Nigeria covering 1980 to 2010, found that whereas real oil prices exercise a significant positive effect on the RER in the long run Productivity differentials exercise a significant negative influence on the RER. Ozsoz and Akinkunmi (2011) investigated the price based determinants of the Nigerian RER. They showed the positive effects of world oil prices on the exchange rate. Coleman, Cuestus, Maurelle and Cuestas (2011) investigated the oil price-exchange nexus using Nigeria as a case study found no long run relationship between REER and real oil prices for Nigeria.

4. VAR Modelling and the Cointegration Approach

Vector autoregression (VAR) modelling and the cointegration approach provide not only an estimation methodology but also explicit procedures for testing the long-run relationship among variables suggested by economic theory.

According to the Granger Representation Theorem (Engle and Granger, 1987), if a P*1 vector, X_t, generated by $(I-L)X_t = d + c(L)\, e_t$, is cointegrated, then there exists a vector autoregression (VAR), an error correction, as well as a moving average (MA) representation of X_t. A set of variables X_t, which is cointegrated, refers to the existence of long-run equilibrium relationships among economic variables (Mungule, 2004). That is, though each series may be non-stationary, there may be stationary linear combinations of the variables. The basic idea is that individual economic time series variables wander considerably, but certain linear combinations of the series do not move too far apart from each other. In economic term, there is a long-run relationship among the variables.

The most common test for cointegration is the two-step procedure of Engle and Granger (1987) which performs well for univariate tests. The first step is to fit the cointegration regression, an ordinary least squares (OLS) estimation of the static model. The second step is to conduct a unit root test on the estimated residuals. To test for cointegration is just to test for the presence of a unit root in the residuals of the cointegrating regression. If the null of a unit root is rejected, then cointegration exists. However, the long-run parameter of the cointegrating vector estimated from this approach can be severely biased in finite samples. An improved procedure of cointegration test is that which allows for more than one cointegrating vector, as suggested in Johansen (1998) and Johansen and Juselius (1990).

Following Johansen and Juselius (1990), let the p variables under scrutiny follow a vector autoregression of order p (VAR(p)) as below,

$$X_t = c + P_1 X_{t-1} + \ldots + P_P X_{t-P} + e_t \quad (5)$$

where, X_t = nxl vector of economic variables in the model; c = nx1 vector of constants or drift terms are innovations of this process and are assumed to be drawn from p-dimensional independently, identically distributed (i.i.d.) Gaussian distributions with covariance G; and $X_{P+1}, \ldots X_0$ are fixed.

Where;

Pi = nxn matrixes of time invariant coefficients, i 1,...,p, and

e = nxl vector of i.i.d. errors with a positive covariance matrix.

Let Δ represent the first difference filter. The equation can be reparameterized into the equivalent form presented below,

$$\Delta X_t = c + PX_{t-p} + \sum_{i-0}^{p-1} \tau_i \, \Delta X_{t-i} + \tau_t \quad (2)$$

$$Where \ \tau_t = -\tau + \sum_{j-1}^{i} P_j, \qquad for, \qquad i = 1, \ldots, p-1, p = \tau + \sum_{i}^{p} P_j$$

The coefficient matrix P contains information about the long-run relationships among variables. Since e_t is stationary, the number of ranks for matrix P determines how many linear combinations of X_t are stationary. If 0 < Rank (P) = r<p, there exists r cointegrating vectors that make the linear combinations of X_t to become stationary. In that case, P can be factored as "a" and "b", with "a" and "b" being matrixes. Here "b" is a cointegrating vector that has the property that bX_t is stationary even though X_t itself is non-stationary and "a" then contains the adjustment parameters.

Based on an unrestricted estimation that is parameterized in terms of levels and differences, Johansen (1988) proposed likelihood ratio statistics for testing the number of cointegrating vectors. First we must solve the eigenvalues of $|\ddot{e}_i \, S_{PP} — S_{P0}S_{00}^{-1}S_{0P}| = 0$, where S_{00} is the moment matrix of the residuals from the ordinary least squares (OLS) regression of DX_t on ΔX_{t-1} ….. ΔX_{t-P+1}; S_{PP} is the residual moment matrix from the OLS regression of ΔX_{t-P} on ΔX_{t-1} ……. ΔX_{t-P+1}; and S_{0P} is the cross-product moment matrix. The cointegrating vector, b, is solved out as the eigenvectors associated with the r largest statistically significant eigenvalues derived using two test statistics, "maximum eigenvalue statistics" and "trace statistics". The first statistic tests the hypothesis that there are r=s cointegrating vectors against the alternative of r = s + l by calculating the maximum likelihood test statistics as $-T. \ln(1-l_{s+1})$, where T is the sample size and 1_{s+1} is an estimated eigenvalue. The second statistic tests the hypothesis that there exists at most, r cointegrating vectors. If the test is performed by calculating trace statistics:

$$-T \sum_{i=r+1}^{p} ln\{(1 - \lambda i *)/(1 - \lambda i)\}$$

where $\ddot{e}_i$* are eigenvalues obtained from cointegration analysis assuming there is no linear trend.

The model to be estimated has the REER, real oil prices measured by the domestic price of crude oil deflated by the Consumer Price Index and technological productivity measured by the growth rate of the Gross Domestic Product. The model could be linearly stated as:

$$LREER = b_0 + b_1 ROIP + b_2 \, PRODUCTIVITY + Ut$$

Where:

REER = Real Effective Exchange Rate

ROIP = Real Oil Prices

PRODUCTIVITY = Technological Productivity

The result of the descriptive statistics is shown in Appendix table 1.

The skewness measures the asymmetry of the distribution of the series around its mean and have values greater than 0 which indicates that the series is skewed to the right. The peakedness or flatness of the distribution was measured by the Kurtosis with an expected value of 3.0. The result in table 1 shows that the REER and real oil prices satisfy the condition. However, productivity is leptokurtic (greater than 3). The Jarque-Bera test is used to test whether the random variables are normally distributed. The Jarque-Bera test has the null hypothesis of normally distributed residuals. The result overall shows the validation of the hypothesis that the errors are normally distributed.

The test for stationarity and the order of integration among the variables were done with both the Augmented Dickey Fuller (ADF) and Phillip Peron (PP) tests. The results of both tests are shown in Appendix table 2 below: The ADF and PP unit root test results in table 2 shows that all the variables were nonstationary. They however became stationary after taken their first difference. This thus permits us to proceed to the next stage of our estimation which is the cointegration test. The summary of the Johansen cointegration test is shown in appendix table 3 below:

The result from appendix table 3 indicates the existence of a long run equilibrium relationship among the real oil prices, REER and productivity. Under this condition, favouring a Vector Autoregression (VAR) in level or first

difference as opposed to the Vector Error Correction Model (VECM) could lead to misspecification because cointegration is established. The number of cointegrating relationship and the number of lags provided a guide for the specification of the VECM. The first step is therefore the identification of the cointegrating relationship that has been suggested in the last section. Appendix Table 4 presents the result of the VECM. A comparative assessment of the error correction term (Coint eq1) at the bottom of table 4 for the first vector shows that the REER has a t value of -3.57475 with the right negative sign. The other variables are either wrongly signed or are statistically insignificant. This suggests that the REER equation constitutes the true congregating relationship in the first vector. The result thus suggests that about 37 percent of the disequilibrium in the REER is corrected each year. The error correction term for real oil price has the right sign and falls within the acceptance region of -1<error correction <0 but it is not statistically significant, while that of productivity measured by the growth rate of the Gross Domestic Product is statistically flawed. The result thus shows how the REER responds to variations in oil prices and productivity.

The above result was further supported by the result from the Granger causality test in Appendix table 5. The result shows the invalidation of the null hypothesis that variation in the real oil prices does not cause a change in the REER and a validation of the alternative hypothesis that variation in the real oil prices cause a change in the REER. This result supports the result of the variance decomposition.

The result from the Autoregressive Conditional Heteroskedasticity(ARCH)/ Generalized Autoregressive Conditional Heteroskedasticity (GARCH) in appendix table 6 suggests that the volatility shocks between real oil prices and the REER are quite persistent because the summation of the ARCH(1) and GARCH(1) coefficients approximately equals unity. The implication of the result is that government policies in tackling the impact of fluctuations in real oil prices are important source of stabilizing the movements in the REER.

5. Conclusion

This paper assessed the link between the real oil prices and the RER in Nigeria by using time series data covering the period 1980 to 2010. The result from the ADF and PP unit root tests showed that all the variables are I(1). The cointegration results showed a long run equilibrium relationship between real oil prices and the REER. This result was supported by the result from the granger causality test which indicates a validation of the causal relationship from real oil prices to REER. The result from the GARCH test suggests the persistence of the volatility between the real oil prices and the REER. The implication of the result is that government policies in tackling the impact of fluctuations in real oil prices are important source of stabilizing the movements in the REER. Thus, the Nigerian government should consider this all important relationship between real oil prices and the REER in planning and implementation of economic policies.

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Appendix 1. Summary of Descriptive Statistics for REER, ROIP and PRODUCTIVITY

	LROIP	LREER	PRODUCTIVITY
Mean	7.893129	4.901208	0.234996
Median	8.115820	4.605170	0.053386
Maximum	10.89534	6.428622	5.505322
Minimum	1.000000	4.051263	-0.070547
Std. Dev.	2.546962	0.692640	1.015096
Skewness	1.220643	1.012284	5.078870
Kurtosis	3.418128	2.631427	26.88014
Jarque-Bera	9.631577	5.116955	0.217412
Probability	0.008101	0.077423	0.000000
Sum	228.9008	142.1350	6.814897
Sum Sq. Dev.	181.6364	13.43300	28.85178
Observations	29	29	29

Appendix 2. Summary of ADF and PP Unit Root Tests Results

Variables	**ADF**			**PP**		
	Level	**1st Difference**	**Order of Integration**	**Level**	**1st Difference**	**Order of integration**
ROIP	-1.159010	-5.449402*	I(1)	-1.570192	-4.583432*	I(1)
REER	-1.925375	-3.422332**	I(1)	-1.612792	-3.445278**	I(1)
PRODUCTIVITY	-2.057382	-4.393803*	I(1)	-2.351024	-3.924131*	I(1)

NB: * & ** Indicate statistical significance at the 1% & 5% levels respectively

Appendix 3. Summary of Johansen Cointegration Test

Hypothesized No. of CE(s)	**Eigen Value**	**Trace Statistic**	**5% CV**	**1% CV**	**Max-Eigen Statistic**	**5% CV**	**1%CV**
None**	0.996334	165.4241	29.68	35.65	151.4344	20.97	25.52
At most 1	0.267969	13.98965	15.41	20.04	8.422178	14.07	18.63
At most2	0.186332	2.56741	3.76	6.65	5.567474	3.76	6.65

NB: Both trace and Max-eigen statistics indicate 1 cointegrating equation at both the 5% and 1% levels.

Appendix 4. Summary of Vector Error Correction Model

Cointegrating Eq:	CointEq1		
LREER(-1)	1.000000		
LROIP(-1)	-0.035589		
	(0.07634)		
	[-0.46617]		
PRODUCTIVITY(-1)	-0.279904		
	(3.14597)		
	[-0.08897]		
C	-4.536288		
Error Correction:	D(LREER)	D(LROIP)	D(PRODUCTIVITY)
CointEq1	-0.356758	-0.270962	0.004293
	(0.09980)	(0.86609)	(0.02320)
	[-3.57475]	[-0.31286]	[0.18506]
D(LREER(-1))	0.212377	0.304156	-0.015855
	(0.17744)	(1.53990)	(0.04124)
	[1.19687]	[0.19752]	[-0.38445]
D(LREER(-2))	0.071168	2.178736	-0.005586
	(0.18222)	(1.58137)	(0.04235)
	[0.39056]	[1.37775]	[-0.13190]
D(LROIP(-1))	-0.025445	-0.258642	-0.003010
	(0.02676)	(0.23224)	(0.00622)
	[-0.95081]	[-1.11369]	[-0.48394]
D(LROIP(-2))	-0.004164	-0.145319	0.003398
	(0.02635)	(0.22868)	(0.00612)
	[-0.15801]	[-0.63546]	[0.55487]
D(PRODUCTIVITY(-1))	-0.272959	0.132406	-0.002335
	(0.08861)	(0.76900)	(0.02060)
	[-3.08038]	[0.17218]	[-0.11339]
D(PRODUCTIVITY(-2))	-0.150249	-0.014932	-0.008541
	(0.05938)	(0.51535)	(0.01380)
	[-2.53011]	[-0.02897]	[-0.61882]
C	-0.082437	0.338230	0.002111
	(0.05925)	(0.51416)	(0.01377)
	[-1.39141]	[0.65783]	[0.15332]
R-squared	0.495617	0.171360	0.111343
Adj. R-squared	0.299468	-0.150889	-0.234246
Sum sq. resids	1.439812	108.4355	0.077777
S.E. equation	0.282824	2.454424	0.065734
F-statistic	2.526736	0.531763	0.322184
Log likelihood	0.724188	-55.45717	38.66369
Akaike AIC	0.559678	4.881321	-2.358745
Schwarz SC	0.946785	5.268427	-1.971639
Mean dependent	-0.045273	0.116520	0.003502
S.D. dependent	0.337911	2.287878	0.059168
Determinant Residual Covariance		0.001643	
Log Likelihood		-12.98904	
Log Likelihood (d.f. adjusted)		-27.33030	
Akaike Information Criteria		4.179254	
Schwarz Criteria		5.485739	

Appendix 5. Result of Pairwise Granger Causality test

Sample: 1980 - 2010
Lags: 2

Null Hypothesis	Obs	F Statistic	Probability
ROIP Does Not Granger Cause REER	27	6.05516	0.04647
REER does not Granger Cause ROIP		0.88127	0.42838

Appendix 6. ARCH/GARCH Result

Dependent Variable: LREER
Method: ML - ARCH (Marquardt)
Convergence achieved after 25 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
LROIP	-0.751315	0.115339	-6.513956	0.0000
C	8.285322	0.540272	15.33546	0.0000
Variance Equation				
C	0.026904	0.024364	1.104254	0.2695
ARCH(1)	1.272947	0.887895	1.433668	0.1517
GARCH(1)	0.050998	0.245727	0.207538	0.8356

R-squared	0.608119	Mean dependent var	4.919301
Adjusted R-squared	0.547830	S.D. dependent var	0.672823
S.E. of regression	0.452430	Akaike info criterion	0.986238
Sum squared resid	5.322018	Schwarz criterion	1.217526
Log likelihood	-10.28669	F-statistic	10.08668
Durbin-Watson stat	2.126808	Prob(F-statistic)	0.000046

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