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The Impact of International Outsourcing on U.S. Workers' Wages: Rethinking the Role of Innovation

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Abstract

The purpose of this paper is to extend Feenstra and Hanson's (1999) analysis of the impact of international outsourcing on wages by considering quality ladders and product cycles theory. Glass and Saggi (2001) found that international outsourcing induces greater incentives for innovation. Hsu (2011) employed a dynamic general equilibrium model to illustrate that outsourcing may affect skilled workers who conduct research and development (R&D) differently from the way it influences skilled workers in manufacturing departments. This paper employs U.S. manufacturing data and finds that international outsourcing increased the wage of skilled workers who conducted R&D in both the 1970s and the 1980s. Outsourcing and expenditure on R&D also increased the relative wages of white-collar workers who are skilled labor but not related to R&D works in the 1980s. The wages of white-collar labor were not increased by international outsourcing in the 1970s.

Keywords: international outsourcing, wage inequality, innovation, two-stage regression

1. Introduction

In the previous two decades, outsourcing and similar subjects have received a great deal of attention from economists (Note 1). Within-country wage divergence in source (or home) countries has been thought to be one of the effects on labor markets caused by outsourcing. Theoretically speaking, outsourcing firms substitute domestic unskilled labor (or labor) with foreign unskilled labor and push producers toward skilled-labor-intensive (or capital-intensive) production, which leads to a decrease in the wages of domestic unskilled labor and increases the wages of skilled labor. Literature such as Slaughter (1995), Feenstra and Hanson (1997), Jones and Kierzkowski (2001), Egger and Kreickemeier (2008), and Sayek and Sener (2006) has supported this argument. Empirical literature struggled to find the wage inequality caused by outsourcing until Feenstra and Hanson (1996; 1999) adopted a new measurement of outsourcing and found that outsourcing could account for 30.9% of the change of the non-production wage share and 15% of the increase in the relative wages of non-production workers during the period 1979–1990 in the United States (Note 2).

There is, however, one unexpected result in Feenstra and Hanson (1996): They can only illustrate the effects of outsourcing on the labor market by employing U.S. data from the 1980s. In the regression results from the 1970s, the effect of outsourcing on the relative wage share of skilled labor to unskilled labor is insignificant and negative. Therefore, the conclusion that outsourcing always raises the wage of skilled labor relative to unskilled labor has an exception. Arndt (1997) argued that even in capital-abundant countries the employment and wages of labor would rise if labor-intensive industry were outsourced, explaining that outsourcing gives producers an advantage against foreign rivals in the end-products market, and the gain from trade enhances the employment in industries that make use of it. Jones (2005) also thought that if the home country has a high proportion of skilled labor to unskilled labor, outsourcing could decrease the relative wage of skilled labor relative to unskilled labor. Thus it seems that the unexpected results in Feenstra and Hanson (1996) can be explained theoretically.

Two additional questions still remain. First, outsourcing, which is thought of as a technological improvement, pushes production toward skilled-labor-intensive production. Thus it should benefit skilled labor the most. Even though outsourcing did not result in all skilled laborers benefiting from outsourcing, some skilled workers should still benefit from it.

Glass and Saggi (2001) followed Grossman and Helpman's (1991) quality ladders and product cycles model in

discussing the outsourcing effects on wages and innovation activities. In the quality ladders and product cycles model, a new generation of products starts with innovation, then production. Glass and Saggi (2001) concluded that "outsourcing lowers the marginal cost of production and thus increases profits, creating greater incentives for innovation." Thus, skilled workers who conduct research and development (R&D) should always benefit from outsourcing. Hsu (2011) employed data from the National Bureau of Economics Research (NBER) and the National Science Foundation (NSF) to show that from 1970 to 1996 scientists, who were the skilled labor involved in R&D work, received a different share of the increase in the wage bill from that of the white-collar workers whose job are not related to R&D.

Based on the facts, Hsu (2011) extended the works of Glass and Saggi (2001) and Sayek and Sener (2006) works by differentiating scientists who only conduct R&D work from white-collar workers. He argued that an increase in outsourcing could increase or decrease the wages of white-collar workers in the outsourcing parent country, depending on whether outsourcing firms are skilled-labor intensive or unskilled-labor intensive; but international outsourcing always increases the wage of scientists. Thus, the insignificant and negative results for the 1970s in Feenstra and Hanson (1996) could be a mixed result of a positive effect on scientists and a non-positive effect on white-collar workers. This paper tests empirically the effects of international outsourcing on laborers who conduct R&D works (hereafter: R&D workers); and the results support the idea proposed by Hsu (2011).

Second, a follow-on question after splitting R&D workers from skilled labor is what the difference in relative wages between white-collar workers and blue-collar workers was in the 1970s and 1980s for U.S. manufacturing industries. Was that difference greater or less than that of the relative wages of non-production and production workers computed by Feenstra and Hanson (1999)?

In sum, the focus of this study is, first, to empirically test whether outsourcing affects R&D workers differently from the way it affects skilled labor in manufacturing production, and second, following Feenstra and Hanson's (1999) two-stage regressions method, to see what the change in the relative wage of white-collar and blue-collar workers is in both the 1970s and 1980s after screening R&D workers from other skilled labor.

2. The Model

2.1 Model Structure

The analysis in this paper is based on the model structure of quality ladders and product cycles theory. Most modeling equations can be found in Hsu (2011) and will not be repeated in this paper, except for the equations of innovation intensity, manufacturing cost, and labor markets.

The model posits two countries, the North and the South. The North is a developed country and outsources part of the production to the developing country, the South. Each country has a representative consumer and an infinite number of firms. All Northern firms can be divided into two industries by their outsourcing preference. The first type of industry is willing to outsource and the other is not. Firms in the North attempt to develop a higher-quality product and win the innovation competition to capture the entire market. To conduct R&D, firms need to hire R&D workers, who exist only in the North. Let w^{RD} be the wage of R&D workers; a_j^{RD} represents the labor requirement per innovation intensity in type j industry. To undertake an innovation of intensity r_j for the time period dt has a cost of $w^{RD} a_j^{RD} r_j dt$. The cost of an innovation should be less than or equal to the reward created by the innovation for a finite intensity of innovation to obtain.

$$V_j^N \leq w^{R\&D} a_j^{RD} \quad \text{with equality whenever } r > 0 \text{ and } j=1, 2 \tag{1}$$

where V_j^N is the market value of an industry-leading Northern firm. After winning the innovation competition, the firm can start producing its products by hiring white-collar and blue-collar workers.

Let w_N^W and w_N^B be the wage of white-collar and blue-collar workers in the North. The unit cost of production is

$$AC_j^N = a_j^{NW}(w^N) w_N^W + a_j^{NB}(w^N) w_N^B \quad 0 < a^N < 1 \text{ and } j=1, 2 \tag{2}$$

where a_j^{NW} and a_j^{NB} are the white- and blue-collar workers' unit labor requirements in type j industry; w^N defined as w_N^W / w_N^B is the ratio of Northern white-collar workers. Note that $\partial a_f^{NW} / \partial w^N < 0$ and $\partial a_f^{NB} / \partial w^N > 0$. Since the wages of Southern workers are lower than those of Northern workers, the Northern firm can choose to outsource proportion α of its labor to the South. Undertaking outsourcing intensity ϕ for a

time interval dt, a Northern firm can successfully transfer labor to an outsourcing firm with exogenous probability ϕdt. Let a_1^{OW} and a_1^{OB} be the unit labor requirement for white- and blue-collar workers' of an outsourcing firm in type 1 industry and a^{SW} and a^{SB} be the white- and blue-collar workers' unit labor requirement for Southern firms that receive contracts from outsourcing firms. The unit cost of an outsourcing firm is

$$AC_1^O = (1-\alpha)\left[a_1^{OW}\left(w^N;\alpha\right)w_N^W + a_1^{OB}\left(w^N;\alpha\right)w_N^B\right] + \alpha\left[a^{SW}\left(w^S\right)w_S^W + a^{SB}\left(w^S\right)w_S^B\right] \tag{3}$$

where $w^S = w_S^W / w_S^B$ and $\partial a_1^{OW} / \partial\alpha > 0$ and $\partial a_1^{OB} / \partial\alpha < 0$ (Note 3).

In the Northern labor market, the total labor demand for each type of labor equals the fixed labor supply. Let $\overline{L^{RD}}$, $\overline{L_N^W}$, $\overline{L_N^B}$ denote the fixed labor supply of R&D, white-collar workers, and blue-collar workers; the labor-market equations are

$$\sum_j a_j^r r \equiv \overline{L^{RD}} \ , j{=}1,2 \tag{4}$$

$$\left[\sum_j a_j^{NW}\left(w^N\right) + (1-\alpha)a_1^{OW}\left(w^N\right)\right]E = \overline{L_N^W} \ , j{=}1,\,2 \tag{5}$$

$$\left[\sum_j a_j^{NB}\left(w^N\right) + (1-\alpha)a_1^{OB}\left(w^N\right)\right]E = \overline{L_N^B} \ , j{=}1,\,2 \tag{6}$$

where E is defined as the total expenditure divided by the price of the newest general product. After solving the model, the innovation intensity of type 1 industry can be shown as $r_1 = f\left(\alpha, \phi, w^{N*}\right)$, where w^{N*} is the equilibrium Northern relationship of the wages of white-collar to those of blue-collar workers; this has an indirect effect on r_1. The outsourcing fraction, α, has directly positive effects on the innovation intensity. The effects of an increase in α on the wage of R&D workers is mainly determined by the positive *innovation effect* caused by the change of r_1. The effect of an increase in α on the relative wage of Northern white-collar workers depends on whether the outsourcing industry is white-collar intensive or blue-collar intensive (Note 4). If the outsourcing industry is more white-collar-worker intensive than the non-outsourcing industry, the relative wage of white-collar workers is increased.

2.2 Empirical Methodology

As discussed above, outsourcing increases the intensive of R&D directly and also raises R&D workers' wages, and then outsourcing improves the productivity of and influences the demand for commodities (Note 5), which makes the relative wage of white-collar to blue-collar workers change. This study tests the effect of outsourcing on R&D workers' wages first and then follows the two-stage regression in Feenstra and Hanson (1999) to deal with the second issue.

2.2.1 R&D Workers' Wage Regression

The dependent variable in the wage regressions are the change in log R&D workers' wages. In addition to outsourcing, this study also includes explanatory variables such as change in log real output and change in log capital/output ratio and those structural variables in Feenstra and Hanson (1999), which are computer share and high-tech share (difference) (Note 6). Those explanatory variables are put in the regressions to capture the effect of output, capital, and high technology on the wages of R&D workers. The wage regressions of R&D workers can be written as

$$\Delta W_{it}^{R\&D} = \phi' \ \Delta K_{it} + \varepsilon_{it} \tag{7}$$

where $\Delta W_{it}^{R\&D}$ is the change in log R&D workers' wages and ΔK_{it} is a vector of the change of explanatory variables.

2.2.2 Two-Stage Regression

Two-stage regressions are employed in this analysis primarily because outsourcing and other explanatory variables affect factor prices by influencing the price of the commodity and productivity first. Then the changes in the commodity's price and productivity implied by those structural variables influence factors' prices. The changes in the price and productivity implied by those structural variables, however, are not measurable, but they

can be estimated by performing a regression of the commodities' prices and productivity on the changes of structural variables. Feenstra and Hanson (1999) argue, however, that the sign of product prices cannot be easily predicted, since the closed-form solution does not exist. Intuitively speaking, if outsourcing industries produce goods that are low-skilled labor intensive, outsourcing part of production to developing countries should reduce its cost on the wage bill and will probably reduce product prices. On the other hand, if outsourcing industries produce goods that are high-skilled labor intensive, the effect of cost reduction may not suppress the effect of technological improvement. The price could increase or experience no change (Note 7).

Value-added price here is different from that in Feenstra and Hanson (1999), since R&D expense should be thought of as a sunk cost that needs to be paid before production. The primary factors in this paper are white-collar workers, blue-collar workers, and capital. Value-added prices that exclude R&D workers can be obtained by

$$\Delta \ln P_{it}^{VA-RD} = \left[\Delta \ln P_{it}^{Y} - 0.5 \left(S_{it}^{ME} + S_{it-1}^{ME} \right) \Delta \ln P_{it}^{ME} \right] / 0.5 \left(S_{it}^{VA-RD} + S_{it-1}^{VA-RD} \right) \tag{8}$$

where P_{it}^{VA-RD} and P_{it}^{Y} are value-added and output price excluding R&D in industry i =1, …, N. S_{it}^{ME} denotes the cost-share of intermediate input in industry i =1, …, N. P_{it}^{ME} denotes intermediate input prices, and S_{it}^{VA-RD} denotes the cost share of the value added, excluding R&D cost.

The new state-of-the-art technology invented by R&D workers can improve the industry's productivity and increase product prices. Thus, R&D expenditure to total output should be included in the structural variables while the two-stage regression is run. Conducting R&D requires high-technology facilities and R&D workers. High-technology capital can be captured by high-technology share (difference) and computer share. The wage share of R&D can be represented by R&D payment share, which is computed by total expense in the wage bill of R&D workers divided by the industry's value of shipment. R&D payment share, however, is also influenced by outsourcing, computer, and high-technology share (difference). The relationship of R&D share in the wage bill to structural variables is

$$S_{it}^{RD} = \alpha' \, \Delta Z_{it} + RD_{it} \tag{9}$$

where S_{it}^{RD} is R&D workers' payment share in the total value of shipment, α is a vector of coefficients, ΔZ_{it} is a vector of the change of structure variables, and RD_{it} is a residual term that captures all the other determinants to R&D payment share, which is assumed orthogonal to Z_{it}. If the first-stage regression also takes R&D payment share into consideration, then the regression should become

$$\Delta \ln P_{it}^{VA} + ETFP_{it} = \beta' \, \Delta Z_{it} + \gamma' \, S_{it}^{RD} + \varepsilon_{it} \tag{10}$$

where the $ETFP_{it}$ is Effective Total Factor Productivity (ETFP). Placing equation (9) in Feenstra and Hanson's (1999) first-stage regression yields the following equation:

$$\Delta \ln P_{it}^{VA} + ETFP_{it} = \phi' \, \Delta Z_{it} + \gamma' \, RD_{it} + \varepsilon_{it} \tag{11}$$

where $\phi = \beta + \alpha\gamma$. Let RD_{it} stand for R&D factors; its coefficient γ can tell us the impact of R&D wage payment on dependent variables. Since spending on R&D can enhance technology, the coefficient γ is expected to be positive. A dummy variable that captures grouping effects is also added, and correlation between two-digit industries is allowed when this study estimates equations (9) and (11).

In the second-stage regression, there is an estimation issue addressed by Feenstra and Hanson (1999). Since the dependent variable in the second-stage regression is constructed from the first-stage regression, the disturbance terms in the second-stage regression will be correlated across observations. Feenstra and Hanson (1999) suggest a procedure to correct the standard errors in the second-stage regression. Dumont et al. (2005) find that their correcting method is negatively biased and leads to overestimation of the inferred significance and suggest computing an unconditional variance instead (Note 8). Standard errors in the second-stage regression of this paper follow the method of Dumont et al. (2005).

3. Data

3.1 Data Source and Coordination

According to the NSF, R&D is mainly done by R&D workers, who are scientists and engineers, and supporting personnel, such as technicians and craftsmen. Although the NSF can provide the wage cost and employment figures of R&D in two- and three-digit industries from 1953, their data still cannot be employed in this study for

the following reasons: First, even though the NSF can provide us the number of full-time-equivalent (FTE) scientists and engineers by industry, it has not separated the wage data of scientists from that of engineers and supporting personnel since 1976. This makes the wages of R&D workers unknown. Second, to avoid possible disclosure of information about the operations of individual companies, some industries' data are being withheld for a few years. Thus, this study has to employ another data source to divide skilled labor.

The Current Population Survey (CPS) provides information about workers in the United States regarding their occupations, industries, and wage incomes. The occupation information can be employed to distinguish R&D workers from other white-collar workers. In addition, since 1976 the March CPS supplement can provide data about hours worked (Note 9). The NBER Productivity Database includes the value of shipment, a price deflator for value of shipments, number of employees, number of production worker hours, and number of production workers in 445 manufacturing industries in the 1972 four-digit Standard Industrial Classification (SIC) (Note 10). Since the NBER Productivity Database only covers non-production (skilled labor) and production workers (unskilled labor), this study employs the CPS data as an auxiliary source to divide non-production workers into R&D workers and white-collar workers. However, there are some issues related to data consistency that need to be dealt with before the division is performed.

First, the production/non-production data in the NBER Productivity Database comes from the Annual Survey of Manufactures (ASM), and its production/non-production classification is different from the white-collar/blue-collar classification in the CPS. Berman, Bond, and Griliches (1994) compared the classification of the CPS to that of the ASM and found that these two categories are similar in that they rose together from 1973 until 1987, with the discrepancy never more than two percentage points. Second, the Bureau of Labor Statistics (BLS) changed the census occupational and industrial classification every ten years between 1970 and 1990 (Note 11). This study chooses the 1980 census occupational and industrial classification system as the main one and applies it to the other classification systems. Then, I converted the 1980 census industrial classification to the 1972 three-digit SIC classification (Note 12). Third, the March CPS supplement provides information regarding respondents' wages and hours worked in the previous year. The number of employees in each industry, which can be computed by a headcount of respondents in each industry, however, indicates the current year. For consistency, this study excludes those respondents who did not have wage income last year. Thus, all the data regarding wages, employment, and working hours in each year present information for the previous year.

Even though Berman, Bond, and Griliches (1994) found the difference between the two databases small, the wage shares from the CPS are still higher than those from the NBER Productivity Database. That means that some occupations in the CPS classification of white-collar workers should be included with the production workers. Technicians (213–235), who are also in charge of maintenance and repair, are classified as white-collar workers in the classification of occupations in the CPS, but according to the definition of production workers in ASM (Note 13), they are production workers. After the technicians are re-categorized as blue-collar workers, the wage shares computed from the CPS are closer to those computed from the NBER Productivity Database (Note 14).

To properly put outsourcing in the independent variables, this study follows the work of Feenstra and Hanson (1999), which has two types of measures of outsourcing. The *outsourcing fraction* is the imported purchases of intermediate material divided by total consumption (Note 15). The *broad measure of outsourcing* considers all industries' inputs purchased from other four-digit SIC manufacturing industries, and the *narrow measure of outsourcing* considers only the industries' inputs purchased from the same two-digit SIC industries. Both outsourcing (narrow) and outsourcing (difference) are used in this study; the variable *outsourcing (difference)* is the difference between the narrow measure of outsourcing and the broad measure of outsourcing.

3.2 The Definition of R&D Workers

Even though a respondent's occupation is engineer or scientist, he or she is not necessarily involved in R&D. Some skilled workers not included in this classification of R&D workers actually are involved in R&D. Economists, for example, are in charge of performing economic analyses of the implementation and planning of R&D projects. A designer who is responsible for designing the appearance of new products should also be considered an R&D worker. Therefore, this study has two definitions of R&D workers. The first group, referred to as *narrowly defined R&D workers*, consists of the occupations in which a high proportion of workers are doing R&D. In the 1980 CPS classification of occupations, these occupations are computer scientists (64–65), mathematical scientists (68), and natural scientists (69–83). The second group consists of those broadly defined as R&D workers, which includes narrowly defined R&D workers and occupations in which a lower proportion

of workers are doing R&D. In the 1980 census occupational classification system, they are scientists (64–65, 68, 69–83), engineers (44–62), economists (166), and designers (185). Educational qualifications are also considered. Respondents who are R&D workers must have at least a high school degree (Note 16). The rest of the skilled workers are simply *white-collar workers*.

The regression results under the narrow definition of R&D workers can be thought of as lower-bound results, and those under the broad definition of R&D workers can be thought of as upper-bound results. The broad definition of R&D may cause estimation problems if a considerable fraction of engineers, economists, and designers are not doing R&D jobs. The narrow definition of R&D may cause underestimation if, in fact, most engineers, economists, and designers are R&D workers. Thus, comparing results from both specifications can give us a better answer to the questions. Intuitively speaking, there were fewer engineers, economists, and designers in the 1970s. Those people who are hired in manufacturing industries have a higher probability of doing R&D. Therefore, it is expected that the broad definition should be suitable for cases in the 1970s and the narrow definition should be more suitable for cases in the 1980s.

3.3 The Division Procedure

The division procedure can be separated into two parts. First, by employing the March CPS supplement, this study computes both the R&D workers' and white-collar workers' shares in total skilled laborers' employment and wage by industries. If the data year is later than 1976, R&D workers' and white-collar workers' shares in total skilled laborers' working hours are also computed. The average of working hours of all skilled workers in each industry is also needed for converting employment data of non-production labor in the NBER Productivity Database into working-hour data.

Second, when the R&D workers' and white-collar workers' shares in total skilled laborers' employment and wages are multiplied by wage payment and number of non-production workers in the NBER Productivity Database, the products are R&D workers' wage payment, the white-collar workers' wage payment, the number of employed R&D workers, and the number of white-collar workers. R&D and white-collar workers' wages are wage payments to R&D and white-collar workers divided by the number of employed R&D and white-collar workers.

As for the data after 1976, employment data of non-production workers from the NBER Productivity Database are multiplied by average working hours of all skilled workers from the March CPS supplement to get skilled laborers' hourly data. Then, the second step is redone with R&D workers' and white-collar workers' shares in working hours computed from the March CPS supplement to get the hourly wages and employment for R&D workers and white-collar workers. Last, the data for blue-collar workers are those for production workers in the NBER Productivity Database.

3.4 Data Summary

Table 1 gives summary statistics for workers' data, which I constructed from the NBER Productivity Database and the CPS for 1972–1979 and 1979–1990. R&D workers, who have high-technology skills and are usually well educated, should be expected to receive the highest pay among workers studied. The numbers in Table 1 confirm this idea. In each period, R&D workers get the highest average pay per year. If hourly data is employed, R&D workers still get the highest pay per hour. Annual changes of workers' wages in 1972–1979 tell almost the same story. R&D workers' pay grew the most rapidly in that time period. During 1979–1990, however, according to the data counting workers by numbers of workers employed, R&D workers' pay did not grow the most rapidly. In fact, their pay in 1979–1990 grew the most slowly under the broad definition of R&D workers. If the narrow definition of R&D workers and hourly data are used, R&D workers' pay still grew the most rapidly.

Table 1. Summary statistics

	1972–1979		1979–1990	
	Average (USD/year)	Annual change	Average USD/year or (USD/hour)	Annual change USD/year or (USD/hour)
Average of and change in workers' prices:				
Blue-collar workers	11443	7.460	19641	4.964
			(10)	(4.705)
Non-production workers	16648	7.201	29324	5.432
			(14)	(5.025)

White-collar workers:	15666	7.052	27438	5.517
Under the broad definition of R&D workers			(13)	(5.060)
White-collar workers:	16449	7.179	28939	5.441
Under the narrow definition of R&D workers			(14)	(4.980)
R&D workers:	21571	7.668	37076	4.780
Under the broad definition of R&D workers			(26)	(4.074)
R&D workers:	20665	7.741	34159	4.843
Under the narrow definition of R&D workers			(32)	(6.160)
Factor cost-shares:	Average (percent)	Annual change	Average (percent)	Annual change
Blue-collar workers	12.470	-0.299	10.185	-0.152
Non-production workers	6.653	-0.201	6.442	-0.006
White-collar workers: Under the broad definition of R&D workers	5.292	-0.113	4.984	-0.009
White-collar workers: Under the narrow definition of R&D workers	6.399	-0.129	6.194	0.002
R&D workers: Under the broad definition of R&D workers	1.361	-0.024	1.458	0.022
R&D workers: Under the narrow definition of R&D workers	0.253	-0.009	0.248	-0.001
TFP :				
Broad R&D workers definition		0.587		0.864
(hourly data)				(0.880)
Narrow R&D workers definition		0.537		0.839
(hourly data)				(0.913)

Note. Numbers in parentheses are calculated from hourly data. Workers' average wages are computed over the first and last year of each period and weighted by the industry share of total manufacturing payments to that factor. Those numbers are USD per person per year, or per hour, if hourly data are used. The annual change in TFP is weighted by the industry share of total manufacturing shipments. Numbers of TFP are computed from primary factors—blue-collar workers, white-collar workers, and capital—R&D workers are excluded. See Feenstra and Hanson (1996) for the rest of the summaries of variables, such as outsourcing and capital services.

It is not surprising that low-skilled labor (blue-collar workers) got the lowest pay during these two decades. The annual change, however, was greater than that experienced by white-collar workers and non-production workers in 1972–1979. Note that the difference in annual change between white-collar and blue-collar workers in 1979–1990 is smaller when using hourly data. Feenstra and Hanson's (1999) study counted the numbers of employed workers in the non-production workers category and working-hour data in the production workers category. If hourly data of non-production workers are employed, it may be possible to get a weaker effect of outsourcing on relative wage of non-production workers.

The second part of Table 1 contains summaries of workers' cost share in industry's value of shipment. Both production and non-production workers' share in costs were decreasing, but R&D workers were relatively stable in their cost shares. Following Feenstra and Hanson (1999), this study measures total factor productivity (TFP) by using the primal Tornqvist index, which equals the log change of output minus the share-weighted log change of primary inputs. Primary factors in Feenstra and Hanson (1999) are non-production workers, production workers, and capital, but in this paper they are white-collar workers, blue-collar workers, and capital. From the bottom line of Table 1 it can be seen that TFP grew much faster in the 1980s than the TFP in the 1970s, including some possible R&D workers' increased TFP. In this study, the wage cost of R&D should be thought of as a sunk cost spent by producers before they manufacture their product. Thus, value-added prices in this study are also different from those in Feenstra and Hanson (1999).

Real output and the capital/output ratio can be computed from the NBER Productivity Database. There are two prices employed in computing computer share and high-tech share (difference). They are ex post rental price and ex ante rental price (Note 17). Note that since computer share and high-tech share are only available at the two-digit SIC level, the wage regressions allow the errors to be correlated across four-digit industries with each two-digit industry. Furthermore, since this paper converts the CPS industrial classification into the three-digit SIC, a dummy variable that corresponds to the three-digit CPS industrial classification is needed to capture the grouping effects.

4. Results

4.1 Results of R&D Workers' Wage Regressions

Starting with the same period used by Feenstra and Hanson (1999), Table 2 illustrates the regression of changes in R&D workers' wages from 1979 to 1990. NP stands for non-production workers; BRD is the broad definition of R&D workers, and NRD is the narrow definition of R&D workers. Before non-production workers are split off, neither outsourcing (narrow) nor outsourcing (difference) had a significant positive effect on the change in non-production workers' wages. After filtering R&D workers from non-production workers, outsourcing (narrow) had a significant positive effect on the changes in R&D workers' wages. Therefore, this study finds some evidence to support the idea that outsourcing increased R&D workers' wages during 1979–1990. As for other independent variables, only high-tech share (difference) had significantly positive effects on the change in R&D workers' wage. It can be concluded that outsourcing was a main factor of raising R&D workers' wages in 1979–1990.

The argument that outsourcing raises R&D workers' wages is robust if R&D workers' wages were also affected by outsourcing significantly in 1972–1979. Feenstra and Hanson (1996) found that outsourcing had an insignificantly negative effect on non-production workers' shares in the wage bill in 1972–1979 (Note 18). If R&D workers' wages, as Hsu (2011) predicts, benefit from outsourcing, separating R&D workers from other non-production workers can show why not all skilled labor was hurt by outsourcing. In Table 3, no matter which definition of R&D workers is employed, outsourcing (narrow) had a positive significant effect on R&D workers' wages. Computers in this period had a significantly negative effects on the wages of R&D workers narrowly definition. The change in log real output and change in log capital/output ratio had a significantly negative effect on the wage of R&D workers' wages broadly definition.

Table 2. Changes in the R&D workers' wage: 1979–1990

	Dependent variables: annual wage-changes per working hour					
	NP	BRD	NRD	NP	BRD	NRD
Independent variables:						
Outsourcing (narrow)	0.415	0.853	4.626	0.420	0.583	4.782
	(1.33)	(0.64)	(2.07)	(1.43)	(0.40)	(2.16)
Outsourcing (difference)	-0.326	0.378	-0.149	-0.307	-0.372	0.451
	(1.67)	(0.24)	(0.04)	(1.65)	(0.20)	(0.11)
Capital services (ex post rental prices):						
Computer share	-0.195	-5.640	-3.650			
	(0.56)	(1.59)	(0.84)			
High-tech share (difference)	0.639	-0.594	7.299			
	(1.30)	(0.19)	(0.84)			
Capital services (ex ante rental prices):						
Computer share				-0.214	-4.506	10.969
				(0.45)	(0.57)	(1.24)
High-tech share (difference)				1.648	2.866	13.414
				(7.46)	(0.79)	(2.00)
$\Delta \ln(y)$	0.051	0.343	-0.014	0.042	0.253	-0.389
	(1.76)	(1.40)	(0.02)	(1.78)	(1.00)	(0.49)
$\Delta \ln(k/y)$	-0.004	0.372	-0.198	-0.009	0.224	-0.686
	(0.08)	(0.82)	(0.22)	(0.17)	(0.54)	(0.69)
Constant	0.046	0.044	0.062	0.044	0.033	0.043
	(20.84)	(1.76)	(1.01)	(26.74)	(1.26)	(0.72)
R^2	0.088	0.015	0.039	0.127	0.007	0.058
N	445	445	445	445	445	445

Note. Dependent variables NP are the changes of all non-production workers' wages. Dependent variables BRD are the changes of R&D workers' wages, which are measured according to the broad definition. Dependant variable NRD is the changes of R&D workers' wages, which is measured according to the narrow definition. Numbers in parentheses are the absolute values of *t* statistics; standard errors in all regressions are robust to heteroskedasticity and correlation in the errors within two-digit industry groups. Besides, a dummy variable, which is the 1980 CPS industry classification, is also included in each regression. All dependent and independent variables are measured as annual changes and weighted by average industry share of all manufacturing wage bills.

Table 3. Changes in the R&D workers' wage: 1972–1979

	Dependent variable: annual wage-changes per capita					
	NP	BRD	NRD	NP	BRD	NRD
Independent variables:						
Outsourcing (narrow)	-0.168	1.232	1.943	-0.070	1.480	2.304
	(0.84)	(3.14)	(2.28)	(0.40)	(3.40)	(2.39)
Outsourcing (difference)	-0.152	0.113	1.100	-0.126	0.089	1.021
	(1.47)	(0.47)	(1.92)	(1.14)	(0.33)	(2.07)
Capital services (ex post rental prices):						
Computer share	-0.027	0.042	-5.033			
	(0.06)	(0.05)	(2.13)			
High-tech share (difference)	0.785	1.750	0.836			
	(2.65)	(1.93)	(0.81)			
Capital services (ex ante rental prices):						
Computer share				0.270	0.519	-9.615
				(0.42)	(0.26)	(1.98)
High-tech share (difference)				1.155	1.742	0.384
				(2.43)	(1.95)	(0.30)
$\Delta \ln(y)$	-0.020	-0.187	-0.131	-0.017	-0.180	-0.092
	(0.53)	(2.62)	(0.75)	(0.47)	(2.34)	(0.53)
$\Delta \ln(k/y)$	-0.006	-0.257	-0.057	-0.005	-0.258	-0.033
	(0.14)	(4.16)	(0.27)	(0.13)	(4.16)	(0.16)
Constant	0.075	0.072	0.068	0.076	0.074	0.069
	(19.69)	(11.12)	(5.15)	(19.86)	(11.57)	(5.03)
R^2	0.082	0.086	0.135	0.100	0.076	0.155
N	445	445	445	445	445	445

Note. Dependent variable NP is the changes of all non-production workers' wages. Dependent variable BRD is the changes of R&D workers' wages, which is measured in broad definition. Dependent variable NRD is the changes of R&D workers' wages, which is measured in narrow definition. Numbers in parentheses are the absolute values of *t* statistics and standard errors in all regressions are robust to heteroskedasticity and correlation in the errors within two-digit industry groups. Besides, a dummy variable, the 1980 CPS industry classification, is also included in each regression. All dependent and independent variables are measured as annual changes and weighted by average industry share of all manufacturing wage bills.

4.2 Results of Two-Stage Regression

The data set of this study includes two measures of R&D workers and two measures of foreign outsourcing. Numbers of production hours for all blue-collar workers and skilled labor are available for 1979 through 1990. The results of the R&D workers' wage regressions indicate that the narrow definition of R&D workers should be applied in the study of the 1980s and the broad definition of R&D workers should be applied in the study of the 1970s (Note 19). Thus, in the period from 1979 to 1990, this paper only reports the regression results if the narrow definition of R&D workers is applied. From 1972 to 1979, only the regression results under the broad definition of R&D workers are reported.

In each table of first-stage regression, there are four different regressions. The first two regressions employ ex ante rental prices in computing high-tech capital shares, and the other two regressions use ex post rental prices. In each of the two regressions, the basic regression is ordered first and a regression including R&D factors comes second. The basic regression includes all structural variables in Feenstra and Hanson (1999) as independent variables. In the results of the second-stage regression, this study focuses mainly on the effects from outsourcing. The results of R&D factors are also another focus. The coefficients of the difference between white-collar and blue-collar workers show the changes of the relative wage of white-collar workers.

The order and brief description of tables is as follows: Tables 4 and 5 are first-stage regressions using data in 1979–1990. The regressions in Table 4 use the number of production workers, and those in Table 5 use the number of production hours in skilled labor. Table 6 reports results of the second-stage regression regarding the effects from outsourcing and R&D factors during 1979–1990. Next, Table 7 is first-stage regressions using data in 1972–1979. Table 8 reports the results of second-stage regressions regarding the effects from outsourcing in 1972–1979 (Note 20). The letter *n* denotes narrowly defined R&D workers, i.e., the value-added price plus ETFP

computed from all primary factors excluding the narrowly defined R&D workers. The letter *b* represents broadly defined R&D workers, i.e., the value-added price, plus ETFP computed from all primary factors excluding the broadly defined R&D workers. The letter *h* represents the usage data of the number of production hours in skilled labor.

The question of whether outsourcing and R&D factors were non-neutral technological progress in 1979–1990 can be answered by Table 4. As expected, all coefficients of outsourcing (narrow) are positive. The effects of outsourcing (difference) might be significant, depending on the price this study employs in measuring high-tech capital share; outsourcing (narrow) has a significant positive effect on dependent variables. Computers also can raise value-added prices plus ETFP, if ex post rental prices are applied, but the positive effect vanished with different measuring prices. R&D factors are significantly positive in all specifications.

Table 4. First-stage regression using employment data 1979–1990

	4n.1	4n.2	4n.3	4n.4
Dependent variable: change in value-added prices plus effective TFP				
Independent variables:				
Outsourcing (narrow)	0.087	0.085	0.073	0.072
	(2.42)	(2.36)	(2.10)	(2.12)
Outsourcing (difference)	0.098	0.096	0.068	0.067
	(2.55)	(2.64)	(1.60)	(1.69)
Capital services (ex ante rental prices):				
Computer share	0.198	0.196		
	(1.84)	(1.87)		
High-tech share (difference)	-0.093	-0.099		
	(1.12)	(1.22)		
Capital services (ex post rental prices):				
Computer share			0.154	0.153
			(2.31)	(2.35)
High-tech share (difference)			0.053	0.052
			(0.67)	(0.64)
R&D factors		0.654		0.595
		(2.79)		(2.23)
Constant	0.042	0.042	0.042	0.042
	(80.00)	(80.77)	(78.93)	(80.47)
R^2	0.198	0.214	0.226	0.240
N	445	445	445	445

Note. Dependent variables are computed from primary factors, excluding R&D workers in the narrow definition. Numbers in parentheses are the absolute values of *t* statistics; standard errors in all regressions are robust to heteroskedasticity and correlation in the errors within two-digit industry groups. Besides, a dummy variable, the 1980 CPS industry classification, is also included in each regression. All variables are measured as annual changes and weighted by average industry share of all manufacturing shipments.

This study also employs hourly data of white-collar workers in this period. The results in Table 5, when compared with those of Table 4, show that the significant coefficients of outsourcing (narrow) become weak. These results are sensible, since the difference of annual change in wages between blue-collar and white-collar workers is smaller when using hourly data than when using employment data. Outsourcing is once again a significant factor when ex ante rental prices are applied. R&D factors are significant in all kinds of specifications.

In sum, there are two findings from the first-stage regressions of 1979–1990. First, regarding the narrow definition of R&D workers, outsourcing (narrow) had a significantly positive effect on value-added prices plus ETFP. Second, R&D factors, which are subtracted from R&D workers' payment share in the industry's value of shipment, increased value-added price plus ETFP significantly. Computer share also had a significantly positive effect on dependent variables, but rental price used for measuring capital shares also matters.

Table 5. First-stage regression using hourly data in 1979–1990

Dependent Variable: changes in value-added prices plus effective TFP effective TFP				
	5nh.1	5nh.2	5nh.3	5nh.4
Independent variables:				
Outsourcing (narrow)	0.066	0.065	0.056	0.055
	(2.19)	(2.15)	(1.91)	(1.92)
Outsourcing (difference)	0.075	0.074	0.053	0.053
	(2.22)	(2.29)	(1.42)	(1.48)
Capital services (ex ante rental prices):				
Computer share	0.120	0.119		
	(1.27)	(1.28)		
High-tech share (difference)	-0.081	-0.085		
	(1.07)	(1.15)		
Capital services (ex post rental prices):				
Computer share			0.108	0.108
			(1.96)	(1.97)
High-tech share (difference)			0.051	0.050
			(0.66)	(0.64)
R&D factors		0.459		0.377
		(3.24)		(2.14)
Constant	0.042	0.042	0.041	0.041
	(89.21)	(89.87)	(87.69)	(88.86)
R^2	0.175	0.186	0.199	0.206
N	445	445	445	445

Note. Dependent variables are computed from primary factors, excluding R&D workers according to the narrow definition. Numbers in parentheses are the absolute values of *t* statistics; standard errors in all regressions are robust to heteroskedasticity and correlation in the errors within two-digit industry groups. Besides, a dummy variable, the 1980 CPS industry classification, is also included in each regression. All independent variables are measured as annual changes and weighted by average industry share of all manufacturing shipments.

After the first-stage regression, the second-stage regressions interpret the change of the price for primary factors due to structural variables. The results of estimating the changes of blue-collar and white-collar workers' wages due to outsourcing are reported in Table 6–1. The dependent variable for each second-stage regression comes from a first-stage regression that includes R&D factors. Outsourcing (narrow) has significantly positive effects on white-collar workers' wages even if the hourly data are used. Furthermore, outsourcing increased the difference in wages between white-collar and blue-collar labor by raising the wages of white-collar workers (Note 21). Similar results can be seen in Table 6–2. R&D factors raised the difference in wages between white-collar and blue-collar labor by increasing the wages of white-collar workers and decreasing the wage of blue-collar workers.

Table 6.1. Second-stage regression: estimated factor-price changes in 1979–1990

Dependent variables (first-stage regressions):	4n.2	4n.2	5nh.2	5nh.2
(1) Employing ex ante rental prices for computer share and high-tech share				
Dependent variable: change in share-weighted factor prices explained by:	Outsourcing (narrow)	Outsourcing (difference)	Outsourcing (narrow)	Outsourcing (difference)
Independent variables:				
Blue-collar labor share	-0.011	0.025	-0.009	0.019
	(0.83)	(1.65)	(0.82)	(1.55)
White-collar labor share	0.131	0.077	0.100	0.059
	(2.21)	(2.21)	(2.04)	(1.99)
Difference between white-collar and blue-collar share	0.142	0.052	0.108	0.040
	(2.13)	(1.57)	(1.97)	(1.49)
(2) Employing ex post rental prices for computer share and high-tech share				
Dependent variables (first-stage regressions):	4n.4	4n.4	5nh.4	5nh.4
Difference between white-collar and blue-collar share	0.120	0.037	0.092	0.029
	(1.94)	(1.28)	(1.78)	(1.18)

Note. The letters and numbers in the first row stand for the dependent variables in their first-stage regressions. All dependent variables are computed from regressions that include quadratic terms of outsourcing (narrow) and outsourcing (difference). Numbers in parentheses are the absolute values of *t* statistics.

Table 6.2. Second-stage regression: estimated factor-price changes in 1979–1990

Dependent variables (first-stage regressions): Independent variables:	4n.2	4n.4	5nh.2	5nh.4
Blue-collar labor share	-0.011	-0.008	-0.017	-0.011
	(1.67)	(1.44)	(1.71)	(1.39)
White-collar labor share	0.033	0.034	0.051	0.049
	(1.96)	(2.57)	(2.03)	(2.32)
Difference between white-collar and blue-collar share	0.043	0.042	0.068	0.060
	(1.94)	(2.43)	(2.01)	(2.22)

Note. The letters and numbers in the first row stand for the dependent variables in their first-stage regressions. All dependent variables are computed from regressions that include R&D factors. Numbers in parentheses are the absolute values of *t* statistics.

One of the puzzles of outsourcing is that the phenomenon found in most empirical studies and theoretical models in the 1980s cannot be seen in the 1970s. As the regression results in Table 7 show, outsourcing, as expected, did not increase value-added prices plus ETFP, but it might actually decrease them. High-tech share had similar results as well. After skilled labor was divided into R&D and other white-collar workers, and R&D factors were added, outsourcing (difference) negatively influenced value-added prices plus ETFP at the 10% significance level (Note 22).

Table 7. First-stage regression using the data in 1972–1979

	Dependent variable: Change in value-added prices plus effective TFP			
	7b.1	7b.2	7b.3	7b.4
Independent variables:				
Outsourcing (narrow)	-0.004	-0.004	0.000	0.000
	(0.62)	(0.72)	(0.09)	(0.11)
Outsourcing (difference)	-0.008	-0.008	-0.009	-0.009
	(1.57)	(1.64)	(1.70)	(1.75)
Capital services(ex ante rental prices):				
Computer share	0.009	0.009		
	(0.64)	(0.68)		
High-tech share (difference)	-0.007	-0.007		
	(0.84)	(0.92)		
Capital services (ex post rental prices):				
Computer share			-0.007	-0.007
			(0.62)	(0.60)
High-tech share (difference)			-0.013	-0.013
			(1.80)	(1.83)
R&D factors		0.032		0.026
		(1.71)		(1.49)
Constant	0.072	0.072	0.072	0.072
	(350.77)	(351.29)	(349.75)	(350.37)
R^2	0.041	0.046	0.054	0.057
N	445	445	445	445

Note. Dependent variables are computed from primary factors and exclude R&D workers according to the broad definition. Numbers in parentheses are the absolute values of t statistics; standard errors in all regressions are robust to heteroskedasticity and correlation in the errors within two-digit industry groups. Besides, a dummy variable, the 1980 CPS industry classification, is also included in each regression. All independent variables are measured as annual changes and weighted by average industry share of all manufacturing shipments.

In Table 8, if the 10% significance level is applied, the wage of white-collar workers was decreased by outsourcing (difference) in the 1970s. The wages of white-collar relative to those of blue-collar workers were decreased as well. This result tells us that it is the decrease in white-collar workers' wages that deteriorated the relative wages of white-collar labor. The results of other structural variables had no significant effects on

workers' wages.

Table 8. Second-stage regression: estimated factor-price changes, 1972–1979

Dependent variables (first-stage regressions):	7b.2	7b.2
(1) Employing ex post rental prices for computer share and high-tech share		
Dependent variable: change in share-weighted factor prices explained by:	Outsourcing (narrow)	Outsourcing (difference)
Independent variables:		
Blue-collar labor share	0.000	0.001
	(0.10)	(0.55)
White-collar labor share	0.000	-0.021
	(0.10)	(1.68)
Difference between white-collar and blue-collar share	0.000	-0.022
	(0.10)	(1.65)
(2) Employing ex ante rental prices for computer share and high-tech share		
Dependent variables (first-stage regressions):	7b.4	7b.4
Difference between white-collar and blue-collar share	-0.004	-0.018
	(0.69)	(1.56)

Note. All dependent variables are computed from regressions that include quadratic terms of outsourcing (narrow) and outsourcing (difference). The letters and numbers in the first row stand for the dependent variables in their first-stage regressions. Numbers in parentheses are the absolute value of *t* statistics.

5. Conclusion

The topic of the impact of international outsourcing on wages has been discussed much by previous literature. Feenstra and Hanson (1996; 1999) employed U.S. data, and their empirical results support the argument made by most theoretical literature that international outsourcing is one of the factors that has caused wage inequality. Feenstra and Hanson's (1996) unexpected results for 1970s could be explained by theoretical works such as Arndt (1997) and Jones (2005). However, two additional questions remain for economists. First, did all skilled labor's wages decrease due to international outsourcing in the 1970s? Second, was the dropping of the relative wage of skilled labor to unskilled labor caused by increasing the wages of unskilled labor or by decreasing the wages of skilled labor?

Hsu (2011) proposed a three-type-worker framework based on the quality ladder and product cycle model and argued that the skilled workers responsible for innovation should be affected by international outsourcing differently from skilled labor that works in the manufacturing department. To assess Hsu's (2011) idea, this study employed the NBER Productivity Database and the March CPS Supplement to construct a new data set with three kinds of labor and wage regressions and two-stage regressions in Feenstra and Hanson (1999) to see the change in U.S. workers' wages in the 1970s and 1980s. This study finds that, first, the wages of U.S. manufacturing R&D workers were increased by international outsourcing in both 1970s and 1980s, and second, outsourcing might have decreased the relative wage of white-collar workers in the 1970s because it might have decreased the wages of white-collar workers and might had no effect on blue-collar workers' wages.

Based on the results of this study, research investigating the impact of international outsourcing on labor markets should consider the role of innovation, which lets part of the skilled labor receive effects different from those of the others. The next step is to examine the impact of globalization on wages under the framework of three types of labor. Feenstra and Hanson (1996) also found that globalization had a significantly negative effect on the wages of skilled labor relative to those of unskilled labor. R&D workers might still benefit from globalization.

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Notes

Note 1. Similar topics are foreign direct investment (FDI or DFI), multinational enterprise (MNE), international fragmentation, and offshoring. See Slaughter (2000) for a summary of MNEs; Jones and Kierzkowski (2001), Deardorff (2001a, 2001b), and Kohler (2004) for international fragmentation; and Grossman and Rossi-Hansberg (2008) for offshoring.

Note 2. Literature such as Lawrence and Slaughter (1993), Berman, Bound, and Griliches (1994), and Slaughter (1995) did not support the idea that outsourcing causes wage inequality. Literature that found the impacts of outsourcing on wage in addition to Feenstra and Hanson (1996; 1999) includes Geichecker (2005) and Hsieh and Woo (2005). Chongvilaivan and Hur (2011) found the wage gap between skilled and unskilled labor can be better explained by general outsourcing than international.

Note 3. That means outsourcing can be thought as a technology improvement that makes production more skilled-labor intensive.

Note 4. The total effect of an increase in the outsourcing fraction on the Northern relative wage consists of three effects: (1) the *substitution effect*, which is caused by outsourcing industries shifting labor demand from the North to the South; (2) the *skill effect*, which can increase labor demand for white-collar workers, since outsourcing pushes firms toward skilled-labor-intensive production; (3) the *scale effect*, the increase in production caused by the increase in profit of outsourcing firms caused by outsourcing.

Note 5. *The substitution effect* and the *skill effect* can be seen as effects on productivity. The *scale effect* mainly focuses on the effect caused by an increase in consumers' total expenditure.

Note 6. Computer share measures the share of office, computing and accounting machinery in total capital. High-tech capital (difference) computes the share of communications equipment, science and engineering instruments, and photocopy and related equipment in total capital.

Note 7. In the early version of this paper, the skilled- and unskilled-labor intensities of relative outsourcing manufacturing industries were computed for U.S. data of both the 1970s and the 1980s. I found that in the 1970s the relative outsourcing industries were unskilled-labor intensive and were skilled-labor intensive in the 1980s. Thus, it is expected that in the regressions for the 1970s the impact of outsourcing on product prices was negative but positive in the regressions for the 1980s. The results are not reported here, but they are available upon request.

Note 8. The author gratefully acknowledges the help provided by Dumont et al.

Note 9. CPS asks how many weeks the respondents worked last year and how many hours they usually worked each week during the previous year. The answers to these two questions can compose hourly data.

Note 10. Originally, there were 450 industries in the four-digit 1972 SIC. By following Feenstra and Hanson (1999), this study excludes three industries (SIC 2067, 2794, 3483) due to missing data on material purchases or prices. Additionally, data from two industries (SIC 3672, 3673) are not available in the recent version of the NBER Productivity Database.

Note 11. The 1980 census occupational classification system evolved from the Standard Occupational Classification (SOC), and the 1990 census occupational classification system was largely based on the 1980 SOC. The industrial classification system used in the 1980 census was based on the 1972 SIC, and industrial classification systems used in the 1990 census were largely based on the 1987 SIC. See the CPS Web site for detailed information.

Note 12. For consistency with the 1970 and 1990 classifications, some industries that were considered as separate in 1980 need to be merged with others. They are census code 122 (merged with 121), 211 (merged with 210), 232 (merged with 241), 301 (merged with 300), 322 (merged with 321), 332 (merged with 331), 350 (merged with 342), 362 (merged with 370), 382 (merged with 381), 390 (merged with 391), and 392 (merged with 391).

Note 13. According to the Web site of the U.S. Census Bureau, production workers include workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, and product development. See http://www.census.gov/mcd/asm-as1.html for details.

Note 14. The correlation coefficient of weighted shares in the wage bill from these two sources is 0.970.

Note 15. See Feenstra and Hanson (1996) and Feenstra and Hanson (1999) for details regarding the formula for computing international outsourcing. The author thanks Feenstra and Hanson for kindly providing intermediate-material purchase data. U.S. import data can be obtained from the NBER collection.

Note 16. The education qualification in the NSF data for an R&D worker is a college degree. Since occupations of R&D workers in this study have more variety, the education qualification in this study is lower.

Note 17. Data for high-technology capital come from the Bureau of Labor Statistics (BLS). Ex post rental prices are computed as in Hall and Jorgenson (1967). Ex ante rental prices are calculated by Berndt and Morrison (1995). All high-tech capital data in this study are kindly provided by Robert C. Feenstra and Gordon H. Hanson, who obtained the data from Catherine Morrison and Don Siegel.

Note 18. Feenstra and Hanson (1997) employed two-stage regressions to assess the impact of trade measured by foreign outsourcing on the relationship between wages of production workers and those of non-production workers in manufacturing from 1972 to 1990. Their results for the period 1972–1979 also indicate that the effects were insignificant.

Note 19. In the period 1972–1979, outsourcing (narrow) had a significantly positive effect on both the narrow definition and broad definition of R&D workers' wages. Since the broad definition of R&D workers includes the narrow definition of R&D workers, the broad definition of R&D workers is more appropriate to be applied in the study of the 1970s.

Note 20. The results of R&D factors show that the impact was insignificant. All results are available upon request.

Note 21. In the unreported results, without non-production workers being divided into R&D and white-collar workers, outsourcing (narrow) had a weak effect on wage inequality if hourly data are employed, while after division, outsourcing (narrow) was significant in influencing workers' wages even if hourly data are used.

Note 22. Theory and intuition predict that if the outsourcing industry is unskilled-labor intensive, the negative impact of outsourcing will be the value-added price, not the value-added price plus TFP. If I switch effective TFP from dependent variables back to independent variables, like estimation equation (6) in Feenstra and Hanson (1999), which they use to justify their approach, the coefficients of outsourcing (difference) becomes significantly negative at the 5% significance level.

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The Persistency of Correlation between Currency Futures: A Macro Perspective

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Abstract

This paper examines the dynamic correlation between currency futures prices. Using the Dynamic Conditional Correlation model (Engle, 2002) this study utilizes time-varying correlations, focusing on the persistency of correlation of currency prices. The sample includes eight currency futures traded on the Chicago Mercantile Exchange from 1999 to 2008 and the U.S. dollar index future. The study finds that the Canadian dollar and the Australian dollar have the highest persistency while the Swiss franc and the Russian ruble have the lowest persistency. In addition, the study finds that the time-varying conditional correlation between currency futures and the U.S. dollar futures is influenced by a country's macroeconomic conditions.

Keywords: DCC model, conditional correlation, currency futures, macroeconomic, GARCH

1. Introduction

According to the Triennial Central Bank Survey, conducted by the Bank of International Settlements, the forex market averages about $5.3 trillion per day (as of April 2013) (Note 1). Due to the important role this market plays in the world economy, the literature for the forex market has been growing rapidly. In this particular study we examine the dynamic correlation across currency futures prices to U.S. dollar index futures (Note 2), with a focus on the persistency of correlation between eight currency futures prices traded on the Chicago Mercantile Exchange: British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble. Using the Dynamic Conditional Correlation (DCC) model developed by Engle (2002), we incorporate time-varying correlations into our analysis. This study differentiates from previous studies in that it is the first to analyze the persistency of relation between currencies future prices.

This paper is most related to Lien and Yang (2006), which investigates the effects of spot-futures spread on the risk and return structure in currency markets. Using a bivariate GARCH framework, the authors find evidence that spreads on the risk and return structure of spot and futures markets produce asymmetric effects. The implications of these asymmetric effects are examined, with special consideration given to the performance of futures hedging strategies. This study differentiates from Lien and Yang (2006), however, in that our focus is on the persistency of correlation between currency futures prices and that we instead use a DCC framework. The DCC model is similar to a bivariate GARCH in spirit, but the DCC places several restrictions on how the correlation can change (in essence it is a special case of a bivariate GARCH).

In addition, this paper is also motivated by Harvey and Huang (1991) and Han, Kling and Sell (1999). Both of these papers explore how macroeconomic variables impact the currency futures market. In Harvey and Huang (1991), the authors examine volatility patterns in the forex market. They surmise that increases in volatility are more often attributed to macroeconomic news than private information through trading. In contrast, Han, Kling and Sell (1999) look at day-of-the-week effects in the currency futures market. Evidence in this paper suggests that the day-of-the-week effect is impacted by private information from trading or market microstructures, not macroeconomics news. Our paper tries to build upon these two studies by examining how different macroeconomic conditions affect the currency futures market. More specifically, we examine how four specific macroeconomic variables impact the correlation between US dollar futures and currency futures.

The sample spans from 1999 to 2008. The study finds that the persistency of currency futures interactions varies substantially across different currencies with the Canadian dollar and the Australian dollar having the greatest persistency while the Russian ruble and Swiss franc have the weakest. Further, the study finds that the time-varying conditional correlation between currency futures and the U.S. dollar futures is influenced by a country's macroeconomic conditions.

The rest of the paper is organized as follows: Section 2 describes the data, Section 3 presents the methodology, Section 4 examines the empirical results, and Section 5 gives the conclusion.

2. Data

The initial futures data consists of daily future prices for currency futures over the period January 1999 to December 2008. This data is collected from RC Research (www.Price-Data.com) and includes open, high, low, and close prices; as well as, volume and open interest. All daily future prices are in U.S. dollars. The currency futures included in this study are listed as follows: British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble. All eight currency futures are traded on the Chicago Mercantile Exchange (CME) and all currencies prices are coded the same way—the US$ price of per unit of currency. Table 1 provides a summary of the contract size, approximate margin, and minimal fluctuation of the 8 currency futures.

Table 1. Sample periods for currency futures traded in U.S.

Symbol	Futures Contract	Contract Size	Approximate Margin	Minimum Fluctuation	Observation
AD	Australian Dollar	A$100,000	$1,688.00	0.01 c/A$ = $10	5378
BP	British Pound	62,500 pound	$1,890.00	0.01 c/pound = $6.25	8384
BR	Brazilian Real	BR100,000	$3,500.00	0.005 c/BR = $5	3122
CD	Canadian Dollar	C$100,000	$1,215.00	0.01 c/C$ = $10	7898
EC	Euro Currency	EUR $125,000	$2,700.00	0.01 c/EUR = $12.50	2355
JY	Japanese Yen	Yen 12,500,000	$2,430.00	0.0001 c/JY = $12.50	8014
RU	Russian Ruble	MRR 2,500,000	$3,000.00	0.001 c/RR = $25	3858
SF	Swiss Franc	SF 125,000	$1,958.00	0.01 c/SF = $12.50	8383

Note. This table provides a summary of the listing exchange, the contract size, approximate margin, and minimal fluctuation of the eight currency futures (British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble). The data is daily frequency and spans from January 1999 to December 2008.

The weighted U.S. dollar futures are used as a basis for comparison. The U.S. dollar index (USDX) (Note 3) is an index (or measure) of the value of the United States dollar relative to a basket of foreign currencies. The USDX futures contract has two features that influence its pricing and its use. First, the USDX index is a geometric average, rather than an arithmetic average, of the constituent currencies. Second, the foreign exchange (FX) rates in the USDX index (in U.S. dollars per foreign exchange rate) are in the denominator of the index, implying that a dollar appreciation leads to a higher index level. Both the geometric averaging and the use of quoting convention have implication for the use of the USDX futures contract in hedging a foreign exchange exposure. Eytan, Harpaz, and Krull (1988) point out, the divergence between the geometric and arithmetic averages depend on both the volatilities of the individual currencies and their co-movements (sometimes referred to as their "correlations").

The USDX futures contract began trading on November 20, 1985 on the Financial Instruments Exchange, a division of the New York Cotton Exchange, which is now part of the New York Board of Trade (NYBOT). The USDX index was originally a geometrically weighted average of ten different currencies, with each currency representing a country that was a major trading partner with the United States. With the introduction of the Euro, the USDX index became a geometrically weighted average of six currencies, which represent five major U.S. trading partners and the Euro.

2.1 Index Formula

The formula for the index level on date *t* is the product of the six currencies spot rates, each raised a power related to a currency-specific weight. The general formula for the index can be written as:

$$USDX_t = K \prod_{i=1}^{N} \left(FX_{i,t} \right)^{-w_i} \tag{1}$$

where $USDX_t$ is the calculated level of the USDX index on date t, $FX_{i,t}$ is the foreign exchange rate (U.S. dollars per foreign currency unit) for currency i on date t, w_i is the weight associated with currency i (the weights are determined by the contract specs and sum to one (i.e., $\sum_{i=1}^{N} w_i = 1$), N is the number of currencies in the index for the USDX index, (N is currently six and was formerly ten), and K is a constant. Under the current USDX futures contract specs, the USDX index is equal to (Note 4).

$$USDX_t = 50.14348112 \times \left(Euro_t \right)^{-0.576} \times \left(Yen_t \right)^{-0.136} \times \left(Sterling_t \right)^{-0.119}$$
$$\times \left(Canadian\, Dollar_t \right)^{-0.091} \times \left(Swedish Kroner_t \right)^{-0.042} \times \left(Swiss Franc_t \right)^{-0.036} \tag{2}$$

We first begin by checking for stationarity of the price series data and find that the price series are non-stationary, while their first differences are stationary. This implies that the use of a return series is appropriate, with the return being computed as the log of the current price over the previous price. Table 2 provides the summary statistics of the daily currency futures returns.

Table 2. Summary statistics on daily currency futures returns

	Australian Dollar	British Pound	Brazilian Real	Canadian Dollar	Euro Currency	Japanese Yen	Russian Ruble	Swiss Franc
Mean	0.0318	-0.0085	-0.0734	0.0011	0.0497	0.0562	0.0907	0.0044
Median	0.1576	0.0000	0.0000	0.0000	0.0687	0.0000	0.4308	0.0000
Maximum	0.2245	0.1977	2.7795	0.0930	0.1145	0.3593	1.5433	2.1572
Minimum	-0.1967	-0.2287	-3.2046	-0.1141	-0.1156	-0.1827	-1.5546	-3.3271
Variance	0.0009	0.0009	0.0324	0.0002	0.0007	0.0010	0.0456	0.0011
Std. Dev.	0.2968	0.3037	1.7987	0.1573	0.2666	0.3122	2.1349	0.3377
Skewness	-0.3835	-0.0774	-1.3288	-0.0988	-0.0303	0.5644	0.0156	0.0932
Kurtosis	5.8860	7.1492	172.7144	6.3508	3.8294	8.3769	34.1887	5.9103
Jarque-Bera	1997.82	6021.84	3746507.82	3707.21	67.83	10078.15	156326.66	2970.23

Note. This table reports summary statistics on British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble returns. Daily currency returns are calculated as the difference in daily natural logarithmic of futures prices. Means and variances are multiplied by 100. The Jarque-Bera statistic is distributed as chi-square and tests for normality; the null hypothesis is that the data is distributed as a normal distribution. The data spans from January 1999 to December 2008.

The distribution of the daily futures returns is not normal, according to the Jarque-Bera test, and characterized by high kurtosis; especially, for the Brazilian real and Russian ruble. In addition, the Australian dollar, British pound, Brazilian real, Canadian dollar, and Euro currency futures returns are all negatively skewed. In contrast, the Japanese yen, Russian ruble, and Swiss franc are positively skewed.

Table 3. Correlation matrix of eight currency futures and USDX futures

	Australian Dollar	British Pound	Brazilian Real	Canadian Dollar	Euro Currency	Japanese Yen	Russian Ruble	Swiss Franc	USDX Futures
Australian Dollar	1								
British Pound	0.4191	1							
Brazilian Real	0.0282	-0.0167	1						
Canadian Dollar	0.4600	0.2780	0.0187	1					
Euro Currency	0.4621	0.6614	0.0066	0.2986	1				
Japanese Yen	0.1951	0.2816	0.0129	0.1033	0.3193	1			
Russian Ruble	0.0809	-0.0576	0.0464	0.0949	-0.0985	-0.0860	1		
Swiss Franc	0.3884	0.6283	-0.0052	0.2419	0.9165	0.4025	-0.1596	1	
USDX Futures	-0.4766	-0.7051	0.0039	-0.3767	-0.9351	-0.4559	0.0983	-0.8860	1

Note. This table provides the Spearman Correlations of British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble futures with USDX futures from January 1999 to December 2008.

Table 3 shows the Spearman correlation matrix for the eight currency futures. From the table one can see that the Brazilian real and the Russian ruble have the lowest correlation for the eight currency futures (all correlations are below 16%). The highest correlations that exist are between the Euro currency and the British pound (66%), the Euro currency and the Swiss franc (92%), Euro currency and USDX (-94%), Swiss franc and the British pound (63%), Swiss franc and USDX (-89%), and the British pound and USDX (-71%).

3. Methodology

In this paper we use both a GARCH (1,1) model (with a constant term in the mean equation) and the Dynamic Conditional Correlation (DCC) model. The GARCH (1,1) model can be defined as follows:

$$y_t = \mu + \varepsilon_t, \ \varepsilon_t | I_{t-1} \sim N(0, h_t) \tag{3}$$

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \tag{4}$$

where y_t is a stochastic process with conditional mean μ and ε_t as the error term. Given some past information set (I_{t-1}) ε_t is distributed normally with mean zero and variance h_t. More specifically h_t is the conditional variance, which is modeled as an ARMA process with constant ω, ε_{t-1}^2 is the lagged squared innovations, and h_{t-1} is the lagged conditional variance. α and β are coefficients.

The DCC model, on the other hand, is merely an extension of the Constant Conditional Correlation (CCC) model. The main difference between the two models is that the DCC model allows the correlation matrix to be time varying. The DCC model, therefore, is unique in that it preserves the essence of a univariate GARCH model while incorporating a GARCH-like, dynamic correlation. Accordingly, the DCC can be written as:

$$H_t = D_t R_t D_t \tag{5}$$

$$R_t = diag\{Q_t\}^{-1/2} Q_t diag\{Q_t\}^{-1/2} \tag{6}$$

$$Q_t = S(1-\alpha-\beta) + \alpha \varepsilon_{t-1} \varepsilon'_{t-1} + \beta Q_{t-1} \tag{7}$$

where H_t is the conditional covariance matrix for a vector of k asset returns, R_t is the time-varying correlation matrix, D_t is the $k \times k$ diagonal matrix of time-varying standard deviations from a univariate GARCH model with $\sqrt{h_{i,t}}$ on the ith diagonal, and Q_t denotes the conditional covariance matrix of the standardized residuals. α and β are parameter matrices. In addition S denotes the unconditional covariance matrix of the standardized residuals, while ε_t is the standardized, but correlated, residual vector.

The DCC model is constructed to permit a two-stage estimation of H_t. During the first step, a univariate GARCH model is fitted for each of the assets and the estimates of $h_{i,t}$ are obtained. In the second step, the asset returns are transformed by their estimated standard deviations and used to calculate the parameters of the conditional correlation. The log-likelihood function for the DCC model can be written as follows:

$$
\begin{aligned}
L &= -\frac{1}{2}\sum_t \left(k\log(2\pi) + \log|H_t| + r_t' H_t^{-1} r_t \right) \\
&= -\frac{1}{2}\sum_t \left(k\log(2\pi) + \log|D_t R_t D_t| + r_t' D_t^{-1} R_t^{-1} D_t^{-1} r \right) \\
&= -\frac{1}{2}\sum_t \left(k\log(2\pi) + 2\log|D_t| + \log|R_t| + \varepsilon_t' H_t^{-1} \varepsilon_t \right)
\end{aligned}
\tag{8}
$$

In order to yield consistent parameter estimates a quasi-maximum likelihood estimation (QMLE) is used. The log-likelihood function, which can be expressed as:

$$L(\theta_1, \theta_2) = L_{Vol}(\theta_1) + L_{Corr}(\theta_1, \theta_2) \tag{9}$$

can be divided into two parts.

The volatility part:

$$L_{Vol}(\theta_1) = -\frac{1}{2}\sum_t \left(k\log(2\pi) + \log|D_t|^2 + r_t' D_t^{-2} r_t \right) \tag{10}$$

And the correlation component:

$$L_{Corr}(\theta_1, \theta_2) = -\frac{1}{2}\sum_t \left(\log|R_t| + \varepsilon_t' R_t^{-1} \varepsilon_t - \varepsilon_t' \varepsilon_t \right) \tag{11}$$

4. Empirical Results

4.1 Estimation of DCC Model

The estimate results for the GARCH model and the DCC model (Equation (5) to Equation (11)) are given in Table 4. Because the DCC beta parameter measures persistency of correlation it is therefore able to capture relative stability.

Table 4. DCC model results for eight currency futures

| Futures Contract	Mean Intercept	Equation USDX	Variance Intercept	Equation RESID(-1)^2	GARCH(-1)	DCC DCC α	Estimation DCC β	Log likelihood
Australian Dollar	0.0000	-0.6928***	0.0000	0.0397***	0.9508***	0.0153***	0.9832***	-6279
British Pound	0.0000	-0.7315***	0.0000	0.0692***	0.8757***	0.0331***	0.9581***	-5806
Brazilian Real	0.0000	-0.1693***	0.0000	0.0421***	0.9703***	0.0069***	0.9079***	-6648
Canadian Dollar	0.0001	-0.2920***	0.0000	0.0313***	0.9615***	0.0138***	0.9837***	-6433
Euro Currency	0.0000	-1.1081***	0.0000	0.2537***	0.4107***	0.0728***	0.6073***	-4083
Japanese Yen	0.0000	-0.6507***	0.0000	0.0763***	0.8719***	0.0253***	0.9715***	-6299
Russian Ruble	0.0002	0.2280***	0.0000	0.1334***	0.7876***	0.0304***	0.5178***	-6638
Swiss Franc	0.0000	-1.1663***	0.0000	0.2038***	0.3603	0.0982***	0.3075***	-4791

Note. The table reports the parameter estimates of the DCC model. The table shows the estimates of the mean return and variance equations, the DCC parameters, and the log likelihood statistics for British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble futures. *, **, *** denotes significance at the 10% level, 5% level, and 1% level respectively.

For example, the DCC beta parameter for the Euro is 0.6073. Recall that the Euro carries a 57.6% weight in the U.S. dollar index, which implies that the Euro will naturally be more closely related to the index. Therefore, the fact that the Euro has such a low persistency provides clearer evidence that its stability is low. On the other hand, the weight for the Japanese yen, British pound, and Canadian dollar are 13.6%, 11.9%, and 9.1% respectively; but the corresponding persistency of the correlation (the DCC beta parameter) is 0.9715, 0.9581, and 0.9837. This implies that the stability of the Japanese yen, British pound, and Canadian dollar are relatively high. Overall, the study finds that the Canadian dollar and the Australian dollar have the highest persistency while the Swiss franc and the Russian ruble have the lowest persistency.

Figure 1 shows the dynamic conditional correlation between each of the eight currencies with the U.S. dollar futures. One striking feature is that the conditional correlation (noted as rho) between the Brazilian real and the U.S. dollar and the Russian ruble and the U.S. dollar have a tendency to be near zero and often change signs. Also, similar to the results of Table 4, the Australian dollar, British pound, Canadian dollar, and Japanese yen are the most persistently correlated with U.S. dollar futures. However, one does observe that these relationships can vary dramatically over the sample period.
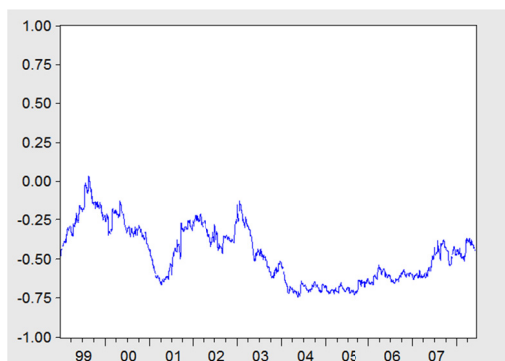
Panel A. Correlation between Australian Dollar and USDX Futures
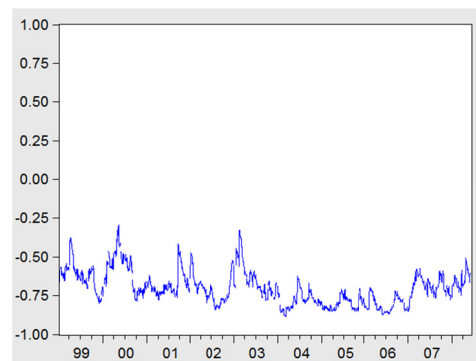
Panel B. Correlation between British Pound and USDX Futures

Panel C. Correlation between Brazilian Real and USDX Futures

Panel D. Correlation between Canadian Dollar and USDX Futures

Panel E. Correlation between Euro Currency and USDX Futures

Panel F. Correlation between Japanese Yen and USDX Futures

Panel G. Correlation between Russia Ruble and USDX Futures

Panel H. Correlation between Swiss Franc and USDX Futures
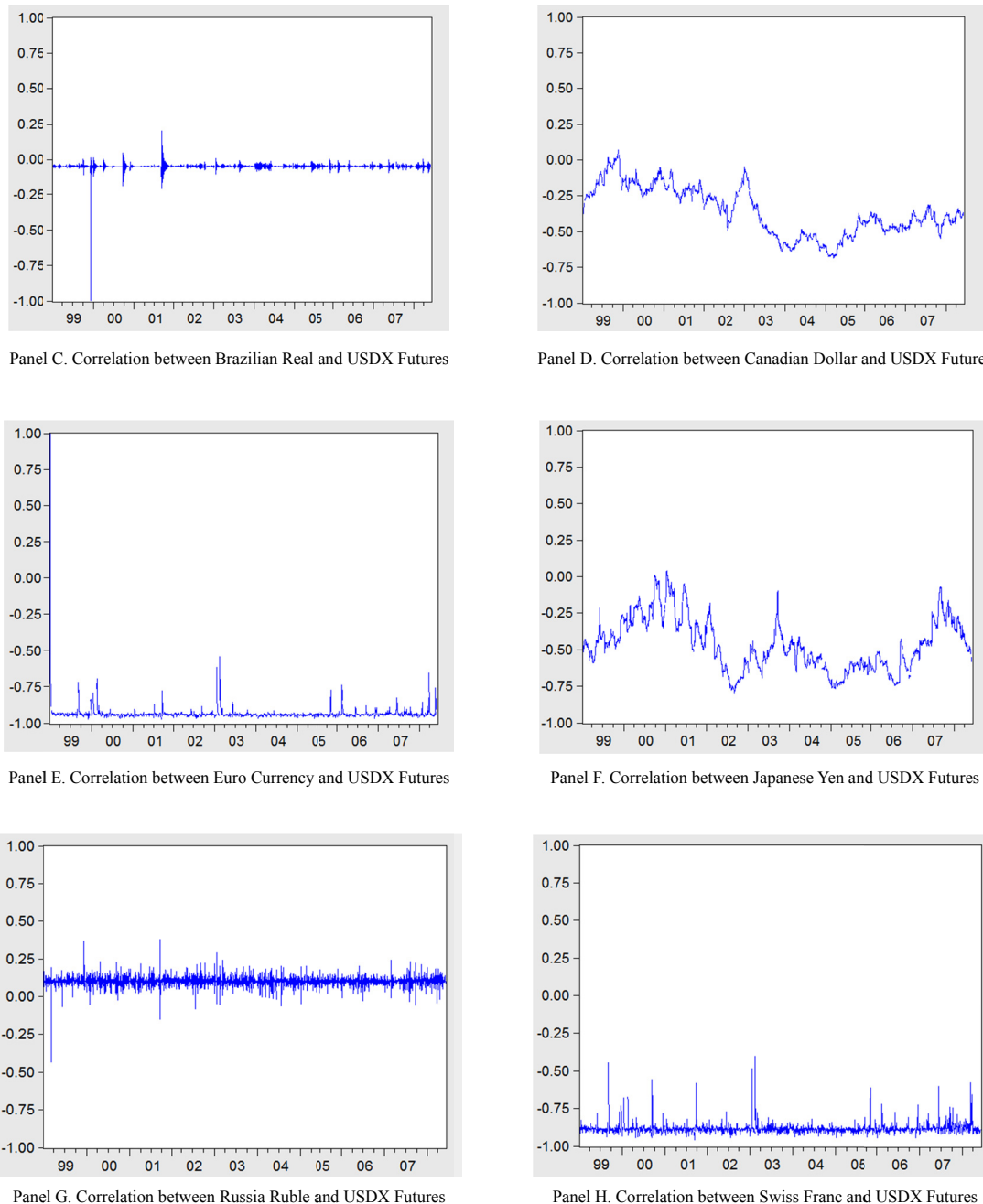
Figure 1. Dynamic conditional correlation

Note. Figure 1 depicts the correlation estimates from the DCC model for the British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble futures from January 1999 to December 2008.

4.2 The Role Macroeconomic Variables

In this section we analysis the contributing factors to the time-varying correlations. In particular, we are interested in a set of macro variable that representing a country's economic growth.

$$rho = a + b_1 \times Industry\ Poduction + b_2 \times Inflation + b_3 \times Risk\ Free\ Rate + b_4 \times Money\ Grown \qquad (12)$$

Table 5 shows how a country's macroeconomic growth impacts the varying correlations between currency futures and U.S. dollar futures. The dependent variable is the correlation (i.e. rho), which is estimated from the DCC model, while the independent variables are the logarithm of industry production, rate of inflation, risk-free rate, and growth of monetary base.

Table 5. Time-varying correlations and country characteristics

Futures Contract	a	b1	b2	b3	b4	t-stat(a)	t-stat(b1)	t-stat(b2)	t-stat(b3)	t-stat(b4)	R-Square
Australian Dollar	6.5355	4.9618	-7.5949	-0.0162	-0.4779	8.07	3.28	-6.05	-0.59	-1.34	0.46
	(0.8099)	(1.5139)	(1.2554)	(0.0273)	(0.3555)						
British Pound	10.8987	-3.4962	-2.4196	0.0495	-0.0032	2.04	-1.54	-4.31	1.89	-0.01	0.19
	(5.3537)	(2.2761)	(0.5610)	(0.0262)	(0.2223)						
Brazilian Real	-0.0896	0.0121	0.0096	0.0001	-0.0040	-1.26	0.24	0.47	0.69	-0.65	0.02
	(0.0710)	(0.0511)	(0.0206)	(0.0002)	(0.0060)						
Canadian Dollar	9.4786	-2.7364	-2.1924	0.0713	-0.0787	5.59	-3.14	-2.43	4.86	-0.39	0.65
	(1.6946)	(0.8712)	(0.9011)	(0.0146)	(0.2045)						
Euro Currency	-0.3188	-0.0096	-0.3177	-0.0121	0.0245	-1.18	-0.13	-2.12	-1.97	0.79	0.57
	(0.2693)	(0.0734)	(0.1497)	(0.0061)	(0.0312)						
Japanese Yen	-20.0789	-2.5421	11.8469	0.4173	0.2088	-2.02	-2.61	2.61	4.48	1.08	0.38
	(9.9588)	(0.9730)	(4.5341)	(0.0931)	(0.1934)						
Russian Ruble	0.0242	0.1103	-0.0619	-0.0006	-0.0045	0.18	0.82	-0.84	-0.23	-0.22	0.04
	(0.1373)	(0.1347)	(0.0738)	(0.0028)	(0.0209)						
Swiss Franc	0.5455	0.4356	-1.0009	-0.0033	-0.0775	1.13	4.04	-3.26	-1.20	-3.12	0.15
	(0.4814)	(0.1077)	(0.3066)	(0.0027)	(0.0248)						

Note. This table reports parameter estimates of $rho = a + b_1 \times Industry\ Poduction + b_2 \times Inflation + b_3 \times Risk\ Free\ Rate + b_4 \times Money$ *Grown* for British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble futures for the period from January 1999 to December 2008. Standard errors are reported in the parenthesis.

For both the Australian dollar and the Swiss franc industry production is statistically significant and positively related with the dependent variable. The Canadian dollar, on the other hand, is statistically significant and negatively related with rho in regards to industry production. As for inflation, with the exception of the Brazilian real and the Japanese yen, all currency futures are negatively related and statistically significant to rho. Only the Japanese yen is positively statistically significant for inflation. Lastly, in regards to the risk free rate and money growth, only the Canadian dollar and the Japanese yen are positively statistically significant for the risk free rate and only the Swiss franc is negatively statistically significant for money growth.

5. Conclusion

This study investigates the time-varying correlation between currency futures prices utilizing the DCC model, focusing on the persistency of correlation. The study finds that the Russian ruble and the Swiss franc have the weakest persistency while the Australian dollar and the Canadian dollar have the greater persistency. However, the relationships do vary somewhat over the sample period. In addition, the study finds that the time-varying conditional correlation between currency futures and the U.S. dollar futures is influenced by a country's macroeconomic conditions; specifically, industry production, inflation, the risk free rate and money growth.

In summary, this paper provides evidence on the persistency between different currency futures (British pound, Brazilian real, Australian dollar, Canadian dollar, Japanese yen, Euro currency, Swiss franc, and Russian ruble) and USDX futures and how macroeconomic growth variables impact that persistency.

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Notes

Note1. http://www.bis.org/publ/rpfx13fx.pdf

Note 2. U.S. dollar index futures are listed on the Financial Instruments Exchange (FINEX).

Note 3. The short-coming of using the U.S. Currency Futures Index is that it is an unequally weighted index, so the currency that is weighted more heavily, such as Euro, will inherently move more closely with the index.

Note 4. In other words, it is a weighted geometric mean of the following: Euro (EUR), 57.6% weight, Japanese yen (JPY) 13.6% weight, Pound sterling (GBP) 11.9% weight, Canadian dollar (CAD) 9.1% weight, Swedish krona (SEK) 4.2% weight, and Swiss franc (CHF) 3.6% weight.

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Is Economical and Social Development Really Linked with the Shift of Labour from Secondary to Tertiary Sector? Evidence from the Italian Case

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Abstract

In the present paper, first, we have carried out a study about regional deprivation in Italy and tested it with a variable test (in this case, life expectancy at birth) to estimate its goodness. RDI index is linked with life expectancy at birth about 60%.

Then we have divided Italian Regions into five different classes, from the "best" (less deprived) to the "worst" (much deprived) one. In each group we have examined the working population in every sector and the share of labourers in primary, secondary and tertiary sector, in order to verify the usual argument according to which growth and socio-economic development go with the boost of tertiary. The tertiary sector is determined according to ISTAT definition, which includes public administration. However, in a further step of our analysis we separate private from public tertiary. The evolution towards the advanced "post-industrial" society is apparently proved wrong in this case.

Keywords: deprivation in Italy, economic sectors development, factorial analysis, social economy

1. Introduction and Objectives

The faster long run growth of the tertiary sector with respect to the secondary is deemed the hallmark of the advanced countries. However, looking at regional development, this can be not always true.

Our propose is to test this evolution in the case of Italian regional development. Therefore we calculate social and economic deprivation in each region and compare it with the shares of labourers in different sectors.

Deprivation indexes highlight the characteristics of the population living in a defined geographical area by measuring the similarities and dissimilarities of individuals belonging to the whole group. They are simple, inexpensive tools generally made up of census indicators easily available and combined using different types of statistical analysis. For this reason, deprivation indexes, after being developed in the United Kingdom with the seminal works of Jarman (Jarman, 1983, 1984), to measure the workload of General Practitioners in England and Wales, Townsend (Townsend, 1987; Townsend et al., 1988) to analyse health measures in the Northern regions of the UK with particular reference to inequalities in health and Carstairs (Carstairs & Morris, 1991), for evaluating inequalities in health within Scotland, have been widely used, spreading across many other countries, such as, between others, Spain (Benach et al., 1999), to measure excess mortality through deprivation, Ireland (Kelleher et al., 2002), with reference also to voting behaviour, the Netherlands (Smith et al., 2002), New Zealand (Hales et al., 2003) and Italy (Brenna, 2007; Costa et al., 2009; Testi & Ivaldi, 2009, 2011) to measure different level of deprivation and share public resources.

2. Methodology

We have constructed an index based on currently available data, which come directly from certified sources. It does not require *ad hoc* surveys, avoiding additional costs, and can be updated in a simple and continuous manner (Jarman, 1983, 1984; Gordon & Pantazis, 1997).

We have conducted a preliminary test on data provided by the most relevant international research bodies. The analysis has focused on a set of variables consistent with those usually selected by current literature (Townsend, 1987; Carstairs & Morris, 1991; Noble et al., 2003; Guio, 2009; Whelan et al., 2010).

To simplify the interpretation, one can group variables into a small number of dimensions according to their fundamental characteristics, by means of the analysis of empirical data, or on the basis of subjective criteria. In our case, we have chosen the first method, using factorial analysis. It is a statistical technique which represents the set of the identified variables in terms of a lower number of underlying variables, so simplifying complex data. Factorial analysis conveys information in the variance/co-variance matrix, trying to identify the latent dimensions of the phenomenon (Dillon & Goldstein, 1984; Stevens, 1986). It explains the maximum possible variance of the variables included in the original information matrix. Thus we obtain a set of new variables through a linear transformation of the original ones, thereby reducing the number of variables needed to describe the phenomenon.

For example, if we have p variables $X_1, X_2, ..., X_j, ..., X_p$ measured on a sample of n subjects, the j-th variable may be written as the linear combination of m factors $F_1, F_2, ..., F_m$ where $m < p$ (Härdle & Simar, 2003). Then

$$X_j = k_{j1}F_1 + k_{j2}F_2 + ... + k_{jm}F_m + e$$

where:

k_{jk} are the factorial scores for the variable j (j=1, 2,3 ,…, p);

e is the part of the variable X_i not explained by the factors.

Since the variables can be saturated by differing factors in almost the same way, the problem of the rotation of factors rises. The rotation brings about the reduction of the weight of the factors that were comparatively "lighter" in the first step of the analysis, along with the increase of the weight of the factors that were comparatively "heavier" (note that here the absolute value is concerned) (Krzanowski & Marriott, 1995). Indeed, in a non-rotation solution any variable is explained by two or more common factors, whereas in a rotation solution any variable is explained by a single common factor (Johnson & Wichern, 2002). With reference to this case study, subsequent tests, using differing algorithms for extraction and rotation, have shown the real stability of the factors extracted (Kaiser, 1958).

According to this methodology, the indicators obtained are to be compared to a variable test to estimate their goodness. In our study, we use life expectancy at birth. The effectiveness of the index is measured by calculating the value of the Pearson correlation coefficient between indicators and variable test.

In order to group the regions, identify classes and discriminate amongst different levels of inequality, the literature suggests homogenous groupings and either breaking down the distribution of indices on the basis of parameters, or using population quintiles (Jarman, 1984; Townsend et al., 1988; Carstairs & Morris, 1991; Carstairs, 2000).

We have decided to use population quintiles. Thus the share of laborers in one class has approximately the same weight as in another, and any distortion due to the different demographic relevance of Italian regions is avoided.

The index distribution has been divided into five classes, class 1 identifying the regions with the lowest deprivation. Each class is correlated with the correspondent value of life expectancy.

Then we disaggregate the labourers according to their respective productive sector, to check the prevailing sector of activities in the regions included in each class. Note that such disaggregation must be done considering only working population. On the other hand the classes have been established on the basis of the whole resident population. This does not cause distortion; indeed deprivation affects both workers and their families, and even the case of families of unemployed represents a form of deprivation. The tertiary sector is defined according to ISTAT definitions, which include the public administration. However at the end of our analysis we separate private from public tertiary.

Our goal is to verify the usual argument according to which the boost of tertiary goes with growth and socio-economic development.

3. Results

The seven variables, selected according to the mentioned methodology, are indicated below:

X_1 = % of unemployed people compared to active (Unemployment rate);

X_2 = % of households living in rented houses (Dwellers in rented houses);

X_3 = average number of people per room (Overcrowding);

X_4 = % of people with secondary education (8 years) or lower (Low education level);

X_5 = inequality in the income distribution (Gini coefficient);

X_6 = single-parent families;

X_7 = ethnic minorities.

The factorial analysis reveals that the variables are distributed on two principal components able to explain the variance at 71% of the total variability of the model (Table 1).

Table 1. Factor analysis score and total variance explained

Table 1a. Rotated component matrix(a)

	Component	
	1	2
Ethnic minorities	**-,917**	-,210
Low education level	**,858**	,055
Unemployment rate	**,837**	,375
Overcrowding	,295	**,809**
Gini coefficient	,408	**,759**
Single-parent families	,025	**,618**
Dwellers in rented houses	-,539	**,575**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a Rotation converged in 3 iterations.

Table 1b. Total variance explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	2,822	40,313	40,313
2	2,130	30,427	70,741

Extraction Method: Principal Component Analysis.

The index spans from -1,369 in Veneto, to 1,893 in Campania: if it is negative, economic and social development are better than average; the opposite if it is positive (Table 2).

Table 2. RDI Index

Region	Regional Deprivation Index (RDI)	Region	Regional Deprivation Index (RDI)
Veneto	-1,369	Marche	-0,278
Friuli-Venezia Giulia	-1,176	Valle d'Aosta	0,027
Trentino	-1,085	Lazio	0,300
Umbria	-1,055	Molise	0,699
Emilia-Romagna	-0,983	Calabria	0,731
Liguria	-0,729	Basilicata	0,819
Lombardia	-0,545	Puglia	1,155
Abruzzo	-0,508	Sardegna	1,231
Toscana	-0,461	Sicilia	1,668
Piemonte	-0,332	Campania	1,893

RDI index is linked with life expectancy at birth. The Pearson correlation coefficient is rather high (-0,592): this means that about 60% of life expectancy gradient is potentially explained by these socio-economic conditions.

The distribution of RDI index has been divided into five classes: class 1 identifies the countries with the best socio-economic conditions (and the best life expectancy), whilst class 5 includes countries characterized by the highest RDI index value (and the worst life expectancy) (Table 3).

Table 3. RDI classes and life expectancy

Class	Region	Life expectancy at birth
1	Veneto, Friuli-Venezia Giulia, Trentino Alto Adige, Umbria, Emilia-Romagna	82,56
2	Liguria, Lombardia, Abruzzo	82,26
3	Toscana, Piemonte, Marche, Valle d'Aosta	82,24
4	Lazio, Molise, Calabria, Basilicata, Puglia	82,17
5	Sardegna, Sicilia, Campania	81,14

In Figure 2 the five classes are put in evidence with different graphic signs.

Figure 2. RDI classes and regions

The first class includes the North Eastern Italy and Emilia Romagna. Here the Italian district model is still granting a high standard of life. A large part of the first class corresponds to the areas labelled by CENSIS (Centro Studi Investimenti Sociali-Observatory on Social Investment) as "Industrial Platform" and "Multifunctional Network of Competitive Manufacture" (ABI-CENSIS, 2014). Also Umbria belongs to this class, mainly due to its high level of education and low inequality of income; it should be noted also the relevance of ethnical minorities, which can be explained by the University of Perugia and important institutions of Catholic Church. In the second class are Liguria, Lombardia and Abruzzo. Here we have areas of old industrialisation (Liguria and Lombardia) which still allows a good standard of living and Abruzzo, where inequality in income is the lowest in Italy and the percentage of households living in rented houses is very low. Valle d'Aosta, Piemonte, Toscana e Marche form the third class. The four regions are heterogeneous. The old industry in Piemonte is declining without any significant balance by new models of growth. On the other hand Toscana and Marche are based on light industry, small firms and tourism. Valle d'Aosta is often considered a

region with good quality of life and has very high income per-capita; but it has also low education, relevant inequality in income and many single-parent families. This explains its comparatively low score. Lazio belongs to the fourth class which includes also four regions in Southern Italy. The bad performance of Lazio (however its ranking is approximately so far from Valle d'Aosta as from Molise) mainly depends on the dramatic inequality in income; furthermore, it has the highest number of single parent families. Finally, the most deprived is the class 5, including Campania, Sicilia and Sardegna. Campania has relevant overcrowding. Sardegna shows the highest unemployment and the lowest education. Sicilia is the most unequal in income region. Remarkably, also the cited research by CENSIS singles out their territorial characters as social and economic imbalance, rural economy with low growth and unstructured pattern industry-trade-tourism.

Life expectancy of each class decreases smoothly from the first (82,56) to the forth class (81,14) and slopes steeply down to the fifth. The difference between the top and the bottom is about 2 years and 6 months. Note that between forth and fifth class the gap is about one year (Table 3).

Then we disaggregate labourers in their different productive sectors, following ISTAT categories. The first sector is composed by agriculture, mines and fishing. The second sector includes industry and building. As is known, the third sector is heterogeneous, since we find there both advanced activities (banking, ICT, finance, management consultants) and other business, e.g., small shops and personal services. It includes also public administration.

Labourers in the first sector increase almost continuously from the first to the fifth class with a marked gap between third and forth class; also the employment in the secondary sector decreases dramatically from class 3 to class 4. Quite unexpectedly, the share of labourers employed in the tertiary sector rises from the first to the fifth class (Table 4a); but the rise is less evident if one excludes public administration (Table 4b).

Table 4a. RDI class and productive sector

Class	Agricultural and fishing	Industry	Tertiary
1	3,21%	32,63%	64,16%
2	2,07%	31,17%	66,75%
3	3,27%	29,34%	67,39%
4	5,70%	19,38%	74,92%
5	5,96%	18,12%	75,92%

Table 4b. RDI class and productive sector

Class	Agricultural and fishing	Industry	Tertiary (P.A. Only)	Tertiary (excluding P.A.)
1	3,21%	32,63%	16,40%	47,76%
2	2,07%	31,17%	15,05%	51,70%
3	3,27%	29,34%	15,96%	51,43%
4	5,70%	19,38%	21,48%	53,44%
5	5,96%	18,12%	24,39%	51,53%

4. Discussion

In our classification, life expectancy decreases uniformly. There is a sharp divide between forth and fifth class, the last one including three regions of Southern Italy. The model of "Italy at different speeds" begins to appear.

The first immediate result is the uniform fall of the share of industry from the first to the fifth class. Particularly there is a drop between the third and the fourth class. Note that fourth and fifth class include the Southern Italian regions except Abruzzo, where the district model partly survives (Becattini 2003; Becattini et al., 2003) and perhaps also the relevance of black economy is less marked.

The divide between the third and the fourth class is confirmed if we look at the share of employees in the primary sector, which increases significantly.

Furthermore the overall tertiary sector soars uniformly, also in this case with a step between the third and the forth class. However the split is even wider if we consider the difference between private and public tertiary. In this case it appears the utmost relevance of the weight of tertiary in the fifth class and also in the forth, where Rome is included. The usual interpretation of the state as employer of last resort is supported especially for the fifth class, taking into account also the high rate of unemployment in Southern Italy. The slightly high share in

the first class could be due to the presence of Army in the North East.

The dimension of the private tertiary sector does not show any significant trend, but there are a couple of noteworthy cases. The lowest percentage is in the first class, where industry is relevant. The small firm system prevailing in Veneto and Emilia Romagna tends to internalise several tertiary functions that big firms are likely to outsource. The development of big firms makes it possible the growth of advanced services provided by enterprises of the tertiary; such evolution can be found in the second class where Lombardia is the biggest industrial region of Italy.

The highest percentage is in the fourth class; it might be explained by the great number of lawyers in Lazio, Calabria and Puglia. Rome is also the capital of Italian entertainment and has a big share of labourers employed in tourism. Furthermore, important Italian tertiary companies, like Trenitalia or Alitalia, are established in Rome.

5. Conclusions

Our paper shows that the common picture of the Italian economy running at different speeds is confirmed also if we look at social development. Italian population may be divided into 5 equal classes, classified according to the respective RDI. Their ranking partly mirrors the distribution of labourers between the three sectors of economy, with the agriculture's increasing weight and industry's decreasing proportion as we pass from the first to the fifth class (the most deprived). Deprivation is accompanied by the comparatively low industrial development.

The behaviour of the tertiary is different, since it increases its proportion as long as deprivation rises. The evolution towards the very advanced "post-industrial" society is apparently proved wrong in this case. We try to explain the oddity, splitting the sector into private and public tertiary. This allows us to single out the peculiar role of the State as "employer of last resort", which absorbs unemployment in the most deprived regions. On the other hand, the private services do not show any clear trend. We can only guess that a few specific causes (tourism, entertainment, institutions ...) engender the high record in the fourth class, whereas the Italian industrial structure, based on small firms localised into North East and big firms in the North West, might explain the result of the first and the second class. Further work should be done to grasp the relation between advanced tertiary and social conditions.

Acknowledgements

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The Japan Stock Split Bubble and the Livedoor Shock

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Abstract

Livedoor, a famous Japanese IT company, experienced rapid growth through the overuse of a stock split strategy. Because of this strategy, the company faced a criminal investigation for suspicion of account rigging in January 2006. In this paper, I examine whether the Japanese stock split bubble burst not only because of system reform to make newly issued shares tradable on their ex-dates, but also because of the Livedoor shock. To explore this possibility, I evaluated data that were classified into specific categories: stock splits under the old system's conditions that prevented the trade of newly issued shares for about 50 days following the ex-date, stock splits under the new system's conditions, and news announced before and after the Livedoor shock. I estimated abnormal returns for each stock on their respective announcement dates. Results demonstrate that under the old system, trading restrictions for newly issued shares caused increases in stock prices, but the Livedoor shock stalled these increases for split stocks. These results suggest that the stock split bubble burst not only because of system reform but also because of changes in investor sentiment with regard to split stocks.

Keywords: stock split bubble, livedoor shock, investor sentiment

1. Introduction

In this paper, I explore the degree to which the Japanese stock split bubble burst can be attributed to changing investor sentiment due to the Livedoor shock in addition to overall system reform.

Stock splits allot new shares to existing shareholders in proportion to their current ownership and increase the total number of outstanding stocks. Typically, stock split announcements and executions do not affect the company's fundamentals or economic activities; however, stock price increases can occur in global markets on the date a split is announced and after the stock's ex-date. A stock price increase resulting from a stock split is largely an anomaly that asset pricing theory, including the efficient market hypothesis, is unable to explain. As a result, a number of researchers have sought to identify the causes of these stock price increases.

Because of the country's unique stock split system, sudden stock price increases in Japan are different from stock price increases in other nations. Until 2005, there was an approximately 50-day delay between a stock's ex-date and the date on which newly issued shares were paid to shareholders. As a result, for roughly two months following the ex-date, the total number of tradable shares in the exchange consisted of only those that were outstanding prior to the split. Until the pay-date, shareholders were unable to trade newly issued shares. Under this stock split system, unique price movements, collectively known as the "stock split bubble," frequently occurred in Japanese markets. It was not until the new stock split system was implemented on January 4, 2006 that new shares can be traded *on* the stock's ex-date, resolving the issues associated with the two-month delay.

Figure 1 illustrates the normalized average closing price of a split stock on the day before the split announcement between October of 2001 and December of 2005 (i.e., pre-system revision) and between January of 2006 and December of 2007 (post-system revision). In addition, to adjust the split ratios, I have multiplied the post-ex-date price by the split factor. The solid line depicts the average price of stocks that split prior to the system revision; the dashed line shows the average price of stocks that split following the system revision. Taken together, these lines communicate four characteristics of the stock split bubble. First, stock prices increase roughly 5% on the stock split announcement date, and then continuously increase. The cumulative return from the stock split announcement date until just before the ex-date is about 16%. Second, stock prices increase sharply on the ex-day. Third, stock prices trend upward after ex-day, but trend downward just before the pay-date. Finally, stock

prices remain approximately steady following the pay-date, but increase to about 18% higher than its price prior to the stock split announcement.

The dashed line in Figure 1 illustrates the average price of stocks that split after the stock split system was revised. Unlike stock splits before the system revision, the dashed line does not display the second, third, or fourth features described above. Although the stock price would largely rise on the date the stock split was announced, it would immediately decrease such that it fell below a standardized score of 100 after 10 days. Moreover, after the stock split system was revised, stock prices generally do not significantly increase. Following the stock split system's revision, stock prices demonstrate the tendency to increase slightly, and then continuously increase to a limited extent. Given this, the stock split bubble seems to have burst with the revision of the stock split system.
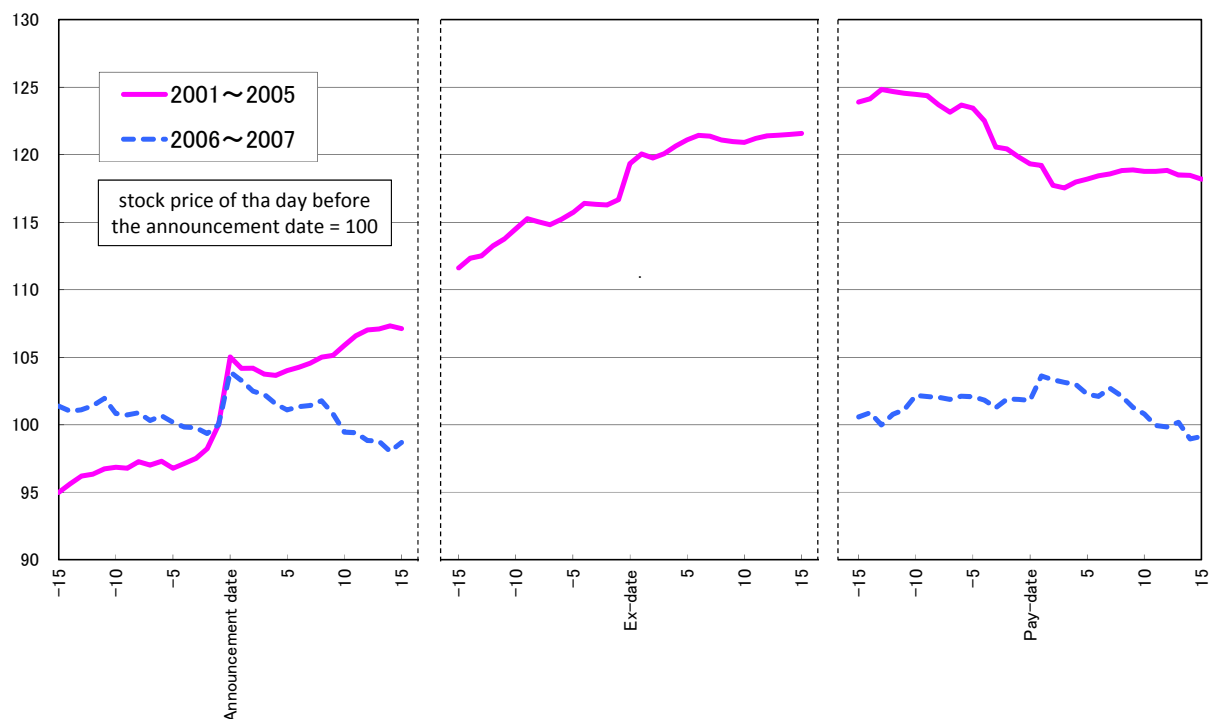
Figure 1. Average price of split stock on pre-revision and post-revision

Greenwood (2009) offered four hypotheses related to the stock split bubble in Japan. Several of these hypotheses were geared towards exploring abnormal returns reported in previous studies on stock splits. Greenwood's (2009) first prediction, which he referred to as the *signaling hypothesis*, suggested that a split announcement yields information about the future fundamental value of a company. Generally, the market treats stock split announcements as indicators of the company's strong future performance (Note 1). In the first empirical research on stock splits, Fama, Fisher, Jensen and Roll (1969) reported abnormal returns around the announcement date, supporting the signaling hypothesis. Other related studies have reported similar findings, further supporting Greenwood's prediction (see Asquith, Healy, & Palepu, 1989; Lakonishok & Lev, 1987; McNichols & Dravid, 1990).

Greenwood's (2009) second hypothesis was referred to as the *liquidity hypothesis*. This hypothesis predicted a positive relationship between the number of investors in a stock and that stock's prices. When a stock splits, its price falls because the number of shares outstanding increases, thereby facilitating trading among small traders. Increase in the number of investors, however, effectively diversifies risk, thereby allowing a rise in stock price. Merton (1987) constructed model of capital market equilibrium with incomplete information. This model indicates that an increase in a firm's investor base increases that firm's value. Amihud, Mendelson, and Uno (1999) analyzed reductions in the minimum trading unit of Japanese stocks and also found that stock prices tend to appreciate in accordance with increases in the number of investors. Finally, Guo, Zhou and Cai (2008) showed that stock splits tend to enhance market liquidity in Japan.

The third hypothesis, known as the *illiquidity discount hypothesis*, relates to decreases in liquidity until newly issued stocks are tradable. This hypothesis predicts that stock prices will decrease when stock splits are announced because investors require a premium for liquidity reduction and non-tradable new shares from ex-date to pay-date. This prediction is largely consistent with Amihud and Mendelson's (1986) prediction that stock illiquidity is positively associated with discounts in the stock price. Because trading restrictions persist until the pay-date, stock prices tend to be lower than prior to the split announcement. This hypothesis is derived from a fully rational model in which traders require the premium for illiquidity; however, there was no support for the hypothesis, as increases in stock price did not occur from an execution of the stock split.

Like the third hypothesis, the fourth hypothesis relates to changes in liquidity caused by lags in the issuing of new shares. Unlike the illiquidity discount hypothesis, however, the fourth hypothesis (hereafter referred to as the *trading restriction hypothesis*) (Note 2) predicts that stock prices will temporarily rise when the number of suppliers (sellers) decreases. Until the stock split system was reformed in 2006, trading restrictions constrained existing shareholders' selling behavior.

For example, if investors feel a stock is underpriced and wish to buy, they continuously do so, even under restrictive conditions. However, in a market where investors trade only old stocks after the ex-date, investors who feel a stock is overpriced would benefit from selling their old holdings to the degree possible. Investors can also take short positions on the old stocks rather than offsetting by the newly received shares on the pay-date. However, most investors (including mutual funds, insurance companies, and small retail investors) tend not avoid taking short positions. Moreover, it is difficult to identify and utilize a counterparty from which to borrow shares once the split is announced. Given this, stock splits under the old system constrained the selling behavior of investors between the ex-date and the pay-date.

The relationship between trading restrictions and stock prices is relatively straightforward. A restricted market in which investors can sell only old stocks extracts potential suppliers of liquidity. It also increases the price impact of trade; greater investor demand for trade during the restricted period is positively associated with stock price (Note 3). In summary, the trading restriction hypothesis dictates that a stock's price will rise on the split announcement date and on ex-date, but decline on the pay-date.

Greenwood (2009) showed that the tendency for a stock's price to rise on the announcement date and ex-date and fall on the pay-date could be explained by the trading restriction hypothesis. Although he conceded that the other hypotheses may have some influence on these phenomena, he argued that they were not sufficient in explaining the pattern of returns around the ex-date and pay-date. In addition, the tendency for a stock's price to remain consistently higher than a pre-announcement stock price for a while following the pay-date is also unexplainable in terms of the trading restriction hypothesis, as trading restrictions do not affect a stock's price after its pay-date. In this study, I explore the possibility that the stock split bubble burst, particularly as defined by the fourth feature, as a result of changing investor sentiment.

This paper's first objective is to empirically evaluate the presumptions that (a) prior to the revision of the stock split system, temporary liquidity shortages caused by trading restrictions affected the stock split bubble, and (b) stock price increases caused by trading restrictions have disappeared following the revision of the stock split system. Additionally, this paper is designed to test whether the signaling and liquidity hypotheses have additional validity.

This study's second objective is to test whether the "Livedoor shock" played a role in the bursting of the stock split bubble. Livedoor, a notable Japanese IT company, experienced rapid growth as a result of overusing the stock split strategy. Specifically, Livedoor performed a 3-for-1 stock split in May of 2001, a 10-for-1 stock split in June of 2003, and a 100-for-1 stock split in December of 2003. Each time Livedoor performed a stock split, the stock's price spiked. Livedoor got an advantage when buying some companies in a stock swap using stock whose price increased due to stock splits. Following this, Livedoor became representative of the stock split bubble. The CEO of Livedoor, Mr. Takafumi Horie, was hailed as a hero of the finance markets as a result of the company's split strategies. However, on January 16, 2006, Livedoor and its associates faced a criminal investigation by Tokyo District Special Investigators for suspicion of account rigging (Note 4). As a result of the announcement of this investigation, stock prices crashed across the Tokyo Stock Market the following day and in the subsequent weeks (Note 5).

In this paper, I consider whether the stock split bubble burst not only because the stock split system was revised, but also because of the investigation of Livedoor. The latter altered investor sentiments such that split stocks were indicative of a company that was performing poorly. The cognitive association between split stocks and poor performance derived from the fact that Livedoor engaged in an extensive split stock strategy and was

subsequently subjected to a criminal investigation. This is in stark contrast to past sentiments related to stock splits that related splits to good company performance (Notes 6 and 7). It is difficult to differentiate the effects of the stock split system revision and the Livedoor shock, as their respective occurrences were nearly simultaneous. However, I was able to collect testable data because regulations associated with the new stock split system apply to stock splits that have ex-dates after the system's revision and many companies announced stock splits one to two months before their stock's ex-date. I avoid difficulties associated with separating the effects of the system revision and the Livedoor shock by using two separate samples that are distinguished in terms of the date on which their stock split was announced—before or after the Livedoor shock.

Though I explore many of the same concepts as Greenwood (2009), this study differs from Greenwood's (2009) in several fundamental ways. First, Greenwood (2009) utilized a sample of 2,094 stock splits between January of 1995 and April of 2005. My sample is comprised of 189 stock splits between October of 2001 and December of 2007. Although my sample is smaller than Greenwood's, I utilize it in a more sophisticated fashion through the exclusion of split stocks that changed relative dividend value to stock price between the announcement date and pay-date. In Japan, even after stock splits, many companies tend to maintain their stock's dividend value (Hanaeda & Serita, 2004). This means that an increase in dividends effectively increases the stock's price. Therefore, to verify the effect of a stock split on the stock's price, we exclude companies that announced changes in dividends between the announcement date and pay-date (Note 8).

Second, Greenwood (2009) tested only the trading restriction hypothesis. In contrast, in this study, I use simple variables to test all the hypotheses outlined above, with the exception of the illiquidity hypothesis. Third, Greenwood (2009) neglected to discuss the reasons why post-pay-date stock prices remain higher than prior to the announcement of a stock split. This cannot be explained by the trading restriction hypothesis because under the old system, prices of stocks that split remain high over the long-term despite the absence of trading restrictions following the pay-date. I believe this is an essential feature of the stock split bubble in Japan and suggest that investor sentiment towards split stocks caused the emergence of the bubble; this sentiment (as well as the bubble itself) disappeared as a result of the Livedoor shock. Using a sample of observations related to stock splits (including after the rule revision), I test the three hypotheses described above, as well as the Livedoor shock hypothesis. Specifically, I estimate abnormal returns for each stock on its split announcement date and regress them on salient outcome variables. Results of these analyses demonstrate that (a) under the old stock split system, trading restrictions on newly issued shares caused increases in stock prices and (b) the Livedoor shock mitigated these split stock price increases. These results suggest that the stock split bubble burst not only because of stock split system reform, but also because of changes in investor sentiment related to split stocks.

To explore and describe these issues more comprehensively, I have organized the remainder of this study into a series of interrelated sections. In Section 2, I describe the Japanese stock-split system. Following this, I detail the effect of the Livedoor shock on split stocks in Section 3. In Section 4, I offer an account of the methods I employed and the results of my empirical analyses. Finally, in Section 5, I offer some concluding remarks.

2. An Outline of the Japanese Stock-Split System

In Japan, listed companies actively split their stocks to increase liquidity and the number of individual investors. The motivations for splitting stocks are two-fold. First, stock splitting has been facilitated by the October 2011 revisions in the Commercial Code (Note 9) and the "action program to promote lower stock investment units" in September of that same year. Market participants came to realize that stock splitting tended to increase stock prices on the date of the announcement, the ex-date, and in the subsequent days despite the fact that these announcements did not affect the company's fundamentals. This increase in the value of the company's stocks following the announcement of a stock split came to be known as the "stock split bubble."

Figure 2 illustrates the schedule of stock splits under the old system. This schedule applied to splits for which the base date (X) was before January 4, 2006. A base date refers to the date by which shareholders who are allotted stock splits must be determined. Note that shareholders who are allotted new shares maintain cum rights on the final trading day (X-4) because settlement shall be made on the fourth day following the final trading day with cum rights. Therefore, a person who holds stocks from the ex-date (the day following the final trading day with cum rights) has no right to receive new shares. However, even if stockholders with cum rights on the final trading day sell all their holdings on the ex-date, he/she still has the right to receive new shares. Following the ex-date, stocks trade at a lower price than on the previous day because a stock split dilutes stock value in accordance with split-ratios.

Under the old system, new shares could be delivered or traded on or after the pay-date (approximately 50 days

after the base date), not the ex-date. As a result, market participants were only able to trade old stocks between the ex-date and the pay-date.

Figure 3 shows the stock split schedule under the revised system. This schedule is applied to splits for which the base date (X) is on or after January 4, 2006. As a result of this revision, the pay-date is shifted from approximately 50 days after the base date to the ex-date (X-3). As a result of this change, market participants can trade new shares on the ex-date or the new pay-date, thereby alleviating restrictions that were in place under the old system.

Figure 2. Schedule of the stock split on pre-revision (before 2006)

Figure 3. Schedule of the stock split on post-revision (after 2006)

3. The Effect of the Livedoor Shock on Split Stocks

In this paper, I argue that the Japanese stock split bubble burst not only because of the reformed stock split system, but also because of the negative effect of a criminal investigation on Livedoor stock. In this section, I discuss how the Livedoor shock negatively affected not only the prices of past split stocks, but also current split stocks.

Performing analyses to this end is problematic, given the identification of a valid sample to confirm the impetus behind the fall of Livedoor stock prices. If the sample includes stock split data under both the old and new systems, it may possibly interact with the other system on the day of the Livedoor shock.

If a sample is comprised of data related to pre-revision stock splits that did not have new issues on the date of the Livedoor shock, the value of the sample stocks on the date of the Livedoor shock may decrease before the pay-date. At this time, it is impossible to distinguish between the respective effects of the Livedoor shock and the delay of new issues under the old system. Therefore, when collecting data from before the system's revision, it is necessary to collect only that data related to stocks that split which have already issued new shares. In contrast, observations with ex-dates before the Livedoor shock, but after the system's revision include three companies. Given the small number of observations in my sample, it is necessary to utilize data that has been collected from split stocks that have been announced, but not completed, before the Livedoor shock.

The remainder of this section is dedicated to demonstrating that the Livedoor shock affects stock splits regardless of the stock split system in practice. To do so, I utilize two separate samples: pre-revision splits and post-revision splits. Pre-revision splits refer to those stock splits that were completely finished under the old system, but prior to the Livedoor shock (such as A-stocks). More specifically, the sample comprising

pre-revision splits includes the splits for which the pay-day is between November 1, 2005, and December 31, 2005, under the old system. Because this sample is comprised of exclusively pre-revision splits, they were affected by the Livedoor shock. The other sample is comprised of stocks for which their splits had already been announced, but had not been implemented under the new system prior to the Livedoor shock (referred to as B-stocks). Because they implemented the splits after the Livedoor shock, (Note 10) all stocks in this sample were subject to the regulations of the revised stock split system.

Table 1 displays the abnormal returns for A-stocks on the day of the Livedoor shock. The raw returns for all stocks were negative and had an average of -4.19%. Similarly, all adjusted abnormal returns (with the exception of two stocks) were negative; their average was -2.36% (Note 11). The average standardized abnormal return was significant and negative at -9.94%. Taken together, these results indicate that the Livedoor shock significantly influenced the prices of stocks that split under the old system.

Table 1. Abnormal return of A-stocks on the date of the Livedoor shock

Security Code	Actual Return	AR	SAR
T2395	-6.94%	-6.15%	-28.07
T2674	-1.92%	-0.78%	-4.31
T3770	-13.19%	-9.13%	-16.37
T4082	-3.44%	-0.97%	-3.85
T4295	-4.53%	-1.33%	-5.02
T4464	-3.32%	-3.09%	-21.74
T4799	-0.33%	0.67%	3.28
T6869	-1.92%	0.83%	4.88
T7741	-3.13%	-1.85%	-17.31
T7867	-3.18%	-1.79%	-10.91
	-4.19%	-2.36%	-9.94
		t-value	-31.44***

Note. *** p < .01.

Table 2. Abnormal return of B-stocks on the date of the Livedoor shock

Security Code	Actual Return	AR	SAR
T2593	-0.26%	1.76%	11.64
T2792	-2.16%	-0.58%	-2.50
T3387	-7.19%	-8.17%	-10.95
T3955	-1.04%	-0.77%	-5.94
T4722	0.38%	2.34%	8.95
T5727	-3.62%	-0.74%	-2.49
T7616	-3.06%	-2.72%	-13.18
T8198	-0.80%	-0.23%	-1.25
T8519	-11.51%	-10.74%	-59.79
T8570	-1.00%	1.07%	7.79
	-3.03%	-1.88%	-6.77
		t-value	-21.42***

Note. *** p < .01.

Table 2 summarizes the abnormal returns for B-stocks on the day of the Livedoor shock. The raw returns for all stocks (except one) were negative. Their collective average was -3.03%. Like the A-stocks, the adjusted abnormal returns were largely negative and averaged -1.88%. The average standardized abnormal return was also significant and negative (-6.77%). These results suggest that the Livedoor shock significantly affected stocks that split under the new system as well.

Because both samples were comprised of a small number of stocks (N = 10) (Note 12), I used the market adjusted model to calculate the abnormal returns. Results of these calculations are listed in Table 3. The adjusted average returns for A-stocks and B-stocks were -2.62% (t = -21.25, p < .01) and -2.20%, (t = -10.37, p < .01).

Taken in concert, these results suggest that the Livedoor shock significantly affected split stocks.

Table 3. Abnormal return on the date of the Livedoor shock using matching portfolio approach

	Observation	AR	t	
A-stocks	33	-2.62%	-21.25	***
B-stocks	20	-2.20%	-10.37	***

Note. Abnormal returns are calculated by using a market adjusted model (deducting average return of the correspond sector). *** p < .01.

4. Data and Empirical Method

4.1 Data

The sample consisted of common stocks listed on Tokyo Stock Exchange (TSE) that split between October of 2001 and December of 2007 with a factor greater than 1.5-to-1. I retrieved data related to the stocks' ex-dates and pay-dates from the TSE and the stock split announcement dates from the Nihon Keizai Shimbun. To avoid the influence of variables other than the stock splits, I excluded stocks that yielded a dividend that changed from the announcement date to the pay-date. As a result of these inclusion and exclusion criteria, the final sample consisted of 189 stock split events. I obtained corresponding price and financial data from the Nikkei Economic Electronic Database System (NEEDs).

Table 4 illustrates the distribution of the 189 observations in terms of split factor across the various years between October of 2001 and December of 2007. As evidenced by Table 4, my sample is comprised of split events characterized by split factors that range from 1.5 to more than 10. Stock splits that are performed with split ratios of 1.5-for-1, 2-for-1, and 3-for-1 account for the vast majority of all splits in the sample (84.7%). For the 2006 data, the figures in parentheses represent the number of split stocks for which splits had already been announced prior to the Livedoor shock. Ten stocks split under the new system and were announced before the Livedoor shock.

Table 4. Distribution of stock split by year and by factor

Year	Split Factor							
	1.5	2	2.05	3	4	5	≧10	Total
2001		2						2
2002	1	5				1	3	10
2003	1	10		1			1	14
2004	3	29		6	2	1	2	43
2005	5	26	1	7	5	6		50
2006	6(4)	30(4)		10(1)	1(1)	3		50(10)
2007	2	14		2		3		21
Total	18(4)	116(4)	1	26(1)	8	14	6	189(10)

Table 5 illustrates the frequency of stock splits by industry. The TSE classifies all listed companies into one of ten industries. As evidenced by Table 5, splits occur in 7 of these industries. Given that splits occur frequently in the manufacturing, transportation and communication, wholesale and retail, and service industries, Table 5 demonstrates that our data are essentially representative of all firms listed on the TSE.

Table 5. Industry distribution of sample stocks

Industry	Number of stocks
Construction	4
Manufacturing	54
Transportation and Communication	32
Wholesale and Retail	39
Financial and Insurance	6
Real Estate	16
Service	38
Total	189

Table 6 summarizes the descriptive statistics associated with split stocks. The average raw return for stocks on the date on which their split is announced is 4.6%. Pre-split turnover is based on the average daily turnover for the period between 135 business days prior to the announcement date and 16 business days prior to the announcement date. Post-split turnover is based on the average daily turnover during the 15-day period following the pay-date. Both turnovers are measured in millions of yen. In my measurement of post-split turnover, I did not include the securities if their outstanding stock volume on pay-date was changed from announcement date to pay-date except by stock split to avoid effects other than the stock split. The average post-split turnover falls below the average pre-split turnover. Stock splits are generally considered effective actions for promoting market liquidity, but this not may be the case here. Although they defined average daily volume following a stock split using the ex-date rather than the pay-date as a baseline, Guo, Zhou, and Cai (2008) reported a decrease in post-split volume on the Tokyo Stock Exchange between March 1996 and December 2005.

Table 6. Descriptive statistics for split stocks

	N	Mean	S.D.	Median	Min	Max
Raw Return on Announcement Date	189	0.046	0.081	0.034	-0.159	0.413
Pre-Split Turnover	189	1.060	3.158	0.179	0.002	27.66
Post-Split Turnover	164	0.987	2.889	0.211	0.003	28.82
Earnings Growth (-1)	140	0.882	7.159	0.160	-3.658	84.25
Earnings Growth (0)	157	0.729	6.748	0.182	-4.590	84.25
Earnings Growth (+1)	170	-0.093	1.626	0.049	-13.162	5.636

To represent the average growth rate of operating profit, (-1), (0), and (-1) respectively represent the previous accounting period, the current accounting period, and the next accounting period. For instance, the average growth rate for the current accounting period was calculated by subtracting the operating profit rate during current period from the operating profit rate during the last period. The average growth rate during the previous accounting period was 0.882. The average growth in period following a split is 0.729. These results provide empirical support for the signaling hypothesis, indicating that a manager may split stocks if he/she anticipates an increase in the operational profit rate.

4.2 The Calculation of Abnormal Return

To calculate abnormal returns, I employed an event study methodology with a market model. An event study methodology calculates abnormal returns surrounding the date of an event date. In this paper, I follow Campbell, Lo, and MacKinlay (1997) to calculate abnormal returns. Specifically, I used the following market model:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}, \ \mathrm{E}\left[\varepsilon_{i,t}\right] = 0, \ \mathrm{Var}\left[\varepsilon_{i,t}\right] = \sigma_i^2 \qquad (1)$$

where $R_{i,t}$ and $R_{m,t}$ respectively indicate actual returns for security i and market return on trading day t. $\varepsilon_{i,t}$ is an error term with average 0 and volatility σ_i^2, α_i, β_i and σ_i^2 are the parameters of the market model. For the purposes of the current study, the estimation window for the parameters was [-135, -16] trading days prior to the announcement of the stock split. I did not include a security if its outstanding stock volume changed from the date of the split announcement to the pay date (except by stock split). These securities were excluded to avoid any unforeseen effects caused by other events. For a market index, I utilized the value-weighted Tokyo Stock Exchange Section 1 index (TOPIX). Because I calculated abnormal returns as per equation (1), I calculated abnormal returns on event date t, A$R_{i,t}$ as follows:

$$AR_{i,t} = R_{i,t} - \hat{\alpha}_i - \hat{\beta}_i R_{m,t} \qquad (2)$$

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are estimates of α_i and β_i, respectively. Using this equation, I calculated (a) the abnormal returns for the 15 days centered on the announcement date and (b) the standardized abnormal returns for each company while accounting for differences in security volatility (i.e., dividing the stock return by its corresponding standard deviation).

4.3 Testable Hypotheses

In this study, I seek to demonstrate the trading restriction hypothesis and the ways in which the Livedoor shock affected investor sentiment. To do so, I treat abnormal returns on the announcement date as the model's outcome variable. Moreover, there are three days that could be used as event dates related to the stock split: the

announcement date, the ex-date, and the pay-date. I focus on abnormal returns on the announcement date because new expectations related to a stock split influence stock prices on that day. Although trading restrictions may affect a stock's price on its ex-date and pay-date, other factors unsatisfactorily explain the effect of investor expectations on stock price on those days. By treating abnormal returns on the announcement date as the outcome measure, it is possible to gauge changes in stock price and investor sentiments before and after the stock split system was revised.

To explore whether stock price is higher after that stock's pay-date relative to its announcement date (perhaps because of the Livedoor shock), it is necessary to compare stock returns from before the stock split announcement to those after the pay-date (but before the Livedoor shock). In addition, to identify and gauge the perpetual effect of the revised system with the Livedoor shock, it is necessary to compare the returns on the stock that implemented a split under the new system before the Livedoor shock, with the returns on the stock that implemented the split under the new system after the Livedoor shock. However, there are only three stocks that have been split under the new system before the Livedoor shock. As a result, the sample associated with this analysis is quite small, preventing my ability to test whether rising prices of split stocks were resolved by the Livedoor shock. Instead, I explore whether stock split announcements incite negative investor sentiment in the wake of the Livedoor shock.

To do so, I employ the following regression equation:

$$AR_i = const. + \beta_1 \cdot D_i + \beta_2 \cdot D\_LS_i + \beta_3 \cdot ILL_i + \beta_4 \cdot D\_ILL_i + \beta_5 \cdot TO_i$$
$$+ \beta_6 \cdot D\_TO_i + \beta_7 \cdot CE\_L1_i + \beta_8 \cdot CE\_0_i + \beta_9 \cdot CE\_1_i + \beta_{10} \cdot AR\_TO_i + \varepsilon_i \qquad (3)$$

The dependent variable is the abnormal returns on the announcement date. D is a dummy variable that equals one if the ex-date is after the stock split system was revised, and zero otherwise. D_LS is a dummy variable to indicate whether a stock split announcement occurred after the Livedoor shock; it equals one if the announcement date is after the Livedoor shock and zero otherwise. ILL signifies illiquidity (which is calculated with equation (3) below). D_ILL is an interaction term that incorporates D and ILL. TO represents turnover with a relaxed trading restriction. D_TO is an interaction term that is comprised of D and TO. CE_L1, CE_0, and CE_1 represent operating profit growth rate during the last accounting period, the current accounting period, and the next accounting period, respectively. Finally, AR_TO signifies the growth rate of daily average turnover for the period before the split announcement and after the pay-date.

The trading restriction hypothesis dictates that abnormal returns occur because of a stock's temporary illiquidity resulting from a stock split under the old system. I predict that there will exist a positive relationship between the magnitude of trading restrictions (ILL) and abnormal returns. Following Greenwood (2009), we define:

$$Trading\ Restriction\ (ILL) = (1-1/split\ factor) \times Turnover\ (TO) \qquad (4)$$

On the right-hand side, *(1-1/split factor)* indicates the proportion of total outstanding stock that is temporarily untradeable following the stock split. Multiplying by the average turnover allows for the estimation of a predicted loss of turnover under trading restrictions.

In addition, I examine the degree to which stock splits affect investor sentiment. It is possible that psychological effects are not proportional to trading restrictions. If investor expectations related to price increases disappear following the revision of the stock split system, we would expect the revision of the system to mitigate the relationship between positive investor sentiments and stock price.

To study this effect, I incorporate a dummy variable to represent whether a stock split after the system was revised (D). If a stock's price increases as a result of investor sentiment, but this effect is mitigated by the system's revision, then the effect of D on stock price is negative.

Note that while D is assigned on the basis of the ex-date, the dependent variable is the abnormal return on the announcement date. Although these dates differ, the ex-date affects the stock price at the announcement date regardless of when the ex-date occurs. This is because on the announcement date, investors are aware of whether the split will take place under the new system or the old system by the ex-date.

The trading restriction hypothesis suggests that under the old system (but not the new system), ILL affects stock returns on the announcement date. As such, one would expect that the coefficient associated with D_ILL will be opposite to (and largely cancel out) the coefficient associated with ILL under the new system. Therefore, I expect that $\beta_3 > 0$ and that $\beta_3 = -\beta_4$.

Greenwood (2009) argued that turnover (TO) serves to relax trading restrictions. I predict that there will exist an inverse relationship between pre-split turnover and the effect of trading restrictions that result from the stock

split. As a result, stock prices can be suppressed. Moreover, I expect turnover to exert a negative effect on stock price. As with *ILL*, we expect this effect to disappear following the revision of the stock split system. Therefore, I expect the coefficient of *D_TO* to offset the coefficient for *TO* under the new system. As such, I believe that $\beta_5 < 0$ and $\beta_5 = -\beta_6$.

Next, we consider the Livedoor shock hypothesis, which states that investor expectations of rising prices due to a split stock disappeared because of the Livedoor shock in January of 2006. If this prediction is true, price increases that would materialize on the announcement date would disappear following the Livedoor shock. To explore this possibility, I developed a dummy variable (*D_LS*) to indicate whether a split was announced before or after the Livedoor shock. *D_LS* equals one if the split announcement was made after the Livedoor shock and zero otherwise. If price increase expectations caused by a stock split are disappear after the Livedoor shock, then the effect of *D_LS* on stock price should be negative (i.e., $\beta_2 < 0$).

In addition to the above, I test the validity of the signaling and liquidity hypotheses. The signaling hypothesis dictates that the market reacts positively to split announcements. To test this possibility, I employ operating profit during the last accounting period (*CE_L1*), the current accounting period (*CE_0*), and the next accounting period (*CE_1*) as predictor variables. I expect each of these variables to positively influence stock price (i.e., $\beta_7 > 0$, $\beta_8 > 0$, and $\beta_9 > 0$).

To test the liquidity hypothesis, I utilize the daily average turnover growth rate from the period before the split announcement to after the pay-date as a predictor (*AR_TO*). More specifically, I utilize a growth rate that divides the average turnover between the pay-date and after 15 business days by the average turnover. I expect this effect to improve liquidity and exert a positive effect on stock price ($\beta_{10} > 0$) (Note 13).

5. Empirical Results

Table 7 reports the results of the estimation of equation (4). Model 1 contains the results of a regression analysis that incorporated all explanatory variables. The coefficient for *ILL* (β_3) was 4.717 (t = 2.67, p < .001). The test of the coefficient condition ($\beta_3 = -\beta_4$) is not rejected by an F-test (Note 14). This result suggests that the rule revision canceled out only the increased price under the old system. Taken together, these results provide support for the trading restriction hypothesis.

In addition, the coefficient for *TO* indicates that it is a negative predictor of abnormal returns. The test of the coefficient condition ($\beta_5 = -\beta_6$) is not rejected by an F-test. This result means that, after the revision, the pre-split turnover has no effect for the price of split stock. It also supports the trading restriction hypothesis. The coefficient for *D* indicates that whether a stock split occurred after the revision of the stock split system is not a significant predictor of abnormal returns, suggesting that the revision of the stock split system did mitigate expectations that stock prices would rise as a result of a stock split. Results also showed *D_LS* to be a significant, negative predictor of abnormal returns. This indicates that the disappearance of the stock split bubble after 2006 is attributable not only to the revision of the stock split system, but also to the criminal investigation of Livedoor and associated fallout across the TSE.

Coefficients associated with the variables for operating profit (*CE_L1*, *CE_0*, and *CE_1*) were non-significant, and fail to support the signaling hypothesis. Similarly, the coefficient for the growth rate of turnover (*AR_TO*), which serves as a proxy for improving liquidity, is also non-significant. As such, our results also fail to support the liquidity hypothesis.

$$AR_i = const. + \beta_1 \cdot D_i + \beta_2 \cdot D\_LS_i + \beta_3 \cdot ILL_i + \beta_4 \cdot D\_ILL_i + \beta_5 \cdot TO_i$$
$$+ \beta_7 \cdot CE\_L1_i + \beta_8 \cdot CE\_0_i + \beta_9 \cdot CE\_1_i + \beta_{10} \cdot AR\_TO_i + \varepsilon_i$$

Table 7. Cross-sectional regression results for the abnormal return on announcement date

	Model 1			Model 2			Model 3		
	coef.	t		coef.	t		coef.	t	
D	1.494	1.38		1.022	0.93		1.021	1.05	
D_LS	-2.98	-2.78	***	-2.377	-2.11	**	-2.416	-2.45	**
ILL	4.717	2.67	***	4.829	3.13	***	4.561	2.64	***
D_ILL	-4.366	-2.26	**	-4.598	-2.59	**	-4.152	-2.2	**
TO	-3.814	-2.72	***	-3.97	-3.28	***	-3.691	-2.7	***
D_TO	3.63	2.44	**	3.804	2.84	***	3.477	2.4	**
CE_L1	0.024	0.75					0.027	0.88	

	coef.	t		coef.	t		coef.	t	
CE_0	-0.1	-0.29							
CE_1	-0.017	-0.09							
AR_TO	-0.124	-1.65							
_cons	2.699	7.28	***	2.549	7.93	***	2.575	8.02	***
R^2	0.154			0.095			0.112		
obs.	124			189			140		
The tests of the coefficient conditions for the trading restriction hypothesis									
(1) $\beta_3 = -\beta_4$	0.20	-0.66		0.07	-0.79		0.28	-0.59	
(2) $\beta_5 = -\beta_6$	0.14	-0.7		0.08	-0.77		0.2	-0.65	

Table 7. Continued

	Model 4			Model 5			Model 6		
	coef.	t		coef.	t		coef.	t	
D	0.847	0.71		0.938	0.85		1.562	1.55	
D_LS	-2.37	-1.96	*	-2.372	-2.11	**	-2.75	-2.69	***
ILL	5.705	2.77	***	5.469	3	***	5.331	3.4	***
D_ILL	-5.292	-2.34	**	-5.231	-2.59	**	-5.075	-2.92	***
TO	-4.651	-2.85	***	-4.473	-3.11	***	-4.336	-3.5	***
D_TO	4.43	2.56	**	4.302	2.78	***	4.166	3.13	***
CE_L1									
CE_0	-0.024	-0.64							
CE_1				0.031	0.21				
AR_TO							-0.055	-1.04	
_cons	2.77	7.59	***	2.632	7.61	***	2.391	7.67	***
R^2	0.092			0.098		0.098	0.124		
obs.	157			170		170	164		
The tests of the coefficient conditions for the trading restriction hypothesis									
(1) $\beta_3 = -\beta_4$	0.20	-0.66		0.07	-0.79		0.28	-0.59	
(2) $\beta_5 = -\beta_6$	0.14	-0.7		0.08	-0.77		0.2	-0.65	

Note. The test statistics of the coefficient conditions are the F statistics. P-values are in parentheses.

*** $p < .01$, ** $p < .05$, * $p < .10$.

That our results have failed to support the signaling or liquidity hypotheses could be overshadowed by a correlation among the three variables related to operating profit growth rate and turnover. Given this, I utilize each of these variables separately for inclusion in the regression analysis. The results of these analyses are respectively presented as Models 3 through 6. Despite analyzing them separately, none of the results support the signaling or liquidity hypotheses. That said, all results of all regression analyses support the trading restriction and the Livedoor shock hypotheses. Model 2 is related to the regression analysis in which all variables related to the signaling and liquidity hypotheses were excluded. These results are robust, thereby providing consistent support for the trading restriction and the Livedoor shock hypotheses (Note 15).

6. Conclusion

In Japan, stock splits became an increasingly popular strategy after 2001. While stock splits grew in popularity, prices of those split stocks increased at the announcement date and ex-date. Post-pay-date stock prices were also substantially higher than pre-announcement stock prices. Taken together, these phenomena comprise what has become known as the "Stock Split Bubble."

Foremost, in this paper, I demonstrated that the Livedoor affair not only decreased the price of Livedoor-related companies, but also the prices of stocks that had split in the past as well as those that split contemporarily. In addition, I have used data that compounds pre-revision and post-revision stock prices to provide support for the trading restriction hypothesis. Results show that the trading restrictions contributed to the formation of the bubble before the stock split system was revised, but had no effect on stock prices following the changes to the stock split system. Further, our data provided no empirical support for the signaling or liquidity hypotheses. Perhaps more importantly, our results showed that although revisions to the stock split system may have contributed to the destruction of the stock split bubble to some degree, the Livedoor affair was also a

contributing element to the burst.

In summary, our analyses have provided empirical support for the trading restriction and Livedoor shock hypotheses, but not the signaling or liquidity hypotheses. Despite these findings, methodological shortcomings associated with our analyses restrict the degree to which I can definitively conclude that the latter two hypotheses have no merit. If data are available, it may be useful to utilize the difference between corporate earnings at split announcements that were forecast by managers or analysts and actual earnings as the predictor of the signaling hypothesis. In addition, it may similarly be useful to utilize the number of shareholders to test the liquidity hypothesis. In short, future research should employ more complex and comprehensive methods to more definitively support or refute the signaling and liquidity hypotheses.

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Notes

Note 1. The signaling hypothesis also represents a possible explanation as to why managers execute stock splits. The signaling hypothesis suggests that managers declare stock splits to communicate positive information related to the future prospects of his/her company.

Note 2. The second hypothesis implies an increase of liquidity after pay-day; the third and fourth hypotheses imply a decrease in liquidity before pay-date.

Note 3. The influence of such a restriction on stock price is comparable to the influence of short selling regulations, as stock prices are more affected by investors with optimistic private information, even if information related to the future value of a stock is normally distributed (Miller, 1977). Several researchers (see Chen, Hong, and Stein, 2002; D'Avolio, 2002; Diamond and Verrecchia, 1987; Duffie, Gârleanu, and Pederson, 2002) have suggested that stock prices do not necessarily reflect the outlooks of traders who are pessimistic or have private information related to the overvaluing of a stock.

Note 4. Horie Takafumi was arrested for violating the Securities and Exchange Act. He was convicted of account rigging in April of 2011.

Note 5. At the time of the Livedoor shock, there were 606,338,627 total outstanding units of Livedoor. This accounted for roughly 45% of all units listed on the Tokyo Stock Exchange. Therefore, a rush of sell orders for Livedoor stock incited a breakdown in the TSE trading system by exceeding its capacity for daily orders.

Note 6. This behavior can be explained by the "representativeness heuristic" (Tversky & Kahneman, 1974). Until 2005, a stock split represented an increase in stock price, which was considered good news by investors. However, following the Livedoor shock in January of 2006, a stock split came to represent a company's poor performance.

Note 7. In its January 17, 2006 evening edition, the Nihon Keizai Shimbun reported the sliding price of a company that split in the past, indicating that market participants have largely focused interest on companies relative to stock splits following the Livedoor-shock .

Note 8. Additionally, my sample is smaller than Greenwood's because I collected 1.5-for-1 split events after October 2001, when the Commercial Code revised.

Note 9. In the revision of the Commercial Code, the net assets per value regulation was abolished, and the unit stock system was introduced, making it possible for issuing companies to set the stock investment unit freely and flexibly by a resolution at a board of directors meeting.

Note 10. I also considered creating another sample comprised of stocks that implement splits under the revised system prior to the Livedoor shock. However, only three companies would have provided valid data for this time frame. Given that these data would have been insufficient for hypothesis testing, this sample was not created.

Note 11. I explain the method for calculating abnormal returns using the market model in the following section.

Note 12. Kothari and Warner (2007) reported that the statistical power associated with these tests is sufficiently high given that the event window is only one day. Therefore, any issues related to sample size are likely minimal.

Note 13. As a proxy for liquidity, I used traded volume rather than turnover. However, I found that this proxy had no significant influence on abnormal returns. I additionally used dummies to respectively indicate whether a stock was from the information-communications industry or a venture startup. Neither of these dummies had a significant effect on abnormal returns.

Note 14. This statistic is calculated such that $F = \left(RSSR - USSR/r\right)/\left(USSR/n - k - 1\right)$ where $RSSR$ is the restricted sum of squared residuals, $USSR$ is the unrestricted sum of squared residuals, n is the number of observations, k is the number of explanatory variables, and r is the number of restrictions (in this case, $r = 1$). This F statistic is distributed as $F(r, n - k - 1)$. For the test of the restriction that $\beta_3 = -\beta_4$, I used the restricted sum of squared residuals from the following restricted regression model:

$$AR_i = const. + \beta_1 \cdot D_i + \beta_2 \cdot D\_LS_i + \beta_3 \cdot I\widetilde{L}L_i + \beta_5 \cdot TO_i + \beta_6 \cdot D\_TO_i +$$
$$+ \beta_7 \cdot CE\_L1_i + \beta_8 \cdot CE\_0_i + \beta_9 \cdot CE\_1_i + \beta_{10} \cdot AR\_TO_i + \varepsilon_i \quad ,$$

where $I\widetilde{L}L$ equals ILL if the ex-date is after the system revision and zero otherwise. For the test of the restriction such that $\beta_5 = -\beta_6$, I used the restricted sum of squared residuals from the following restricted regression model:

$$AR_i = const. + \beta_1 \cdot D_i + \beta_2 \cdot D\_LS_i + \beta_3 \cdot ILL_i + \beta_4 \cdot D\_ILL_i + \beta_5 \cdot \widetilde{TO}_i$$
$$+ \beta_7 \cdot CE\_L1_i + \beta_8 \cdot CE\_0_i + \beta_9 \cdot CE\_1_i + \beta_{10} \cdot AR\_TO_i + \varepsilon_i$$

where *TO* equals *TO* if the ex-date is after the system revision and zero otherwise.

Note 15. I also separately tested the signaling and liquidity hypotheses during pre-revision and post-revision periods. To do so, I used interaction terms that incorporated *D* and *CE_L1*, *CE_0*, *CE_1*, and *AR_TO,* separately. None of the results associated with these analyses provided empirical support for the hypotheses.

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Constraints to Women Smallholder Farmers' Efforts in Ensuring Food Security at Household Level: A Case of Msowero Ward of Morogoro Region Tanzania

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Abstract

Women smallholder farmers (WSFs) play great roles in ensuring food security at household level as a poverty reduction strategy, but they are faced with a number of constraints that deprive them from fulfilling their potential as farmers, food producer, provider and entrepreneur. In evaluating the constraints on WSFs toward ensuring food security at household level as a poverty reduction strategy, this study focused on examining variables such as the women's level of education, access to resources, technology, family size, as well as the agro-inputs. The results showed that 58% of respondents were food secured, while 42% of the respondents were food insecure. Also more than 60% of smallholder farmers in the study area are women, though their efforts and the mechanization of agriculture has marginalized them, and women are more considered as consumers than producers. Morever, WSFs have been less appreciated and continue to suffer from limited access to resources and opportunities especially in agriculture sector. A Logistic regression analysis showed that five out of eight variables analyzed were significant at the 5% level ($p < 0.05$), However, to ensure that research results are utilized and WSFs have access to new irrigation service technology, markets, education, capital, farms, as well as the agro inputs, the government and public and private development sector have to support and integrate short and long-term development initiatives and make sure that the initiatives are conceived and implemented with special consideration of women as smallholder farmers.

Keywords: Morogoro-Tanzania, women-smallholder farmers, constraints, food security, household

1. Introduction to the Problem

As the most challenging issues in the world, food security has been defined as existing when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life (FAO, 1996; Babatunde, Omotesho, & Sholotan, 2007). Most African countries, including Tanzania are primarily agrarian while smallholder farming predominate agriculture sector. The term smallholder farmers only refer to their limited resource endowment relative to other farmers in the sector (Dixon, Abur, & Watterbach, 2005). Usually smallholder farmers own small-based plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour (Todaro, 1989). Most of the smallholder farmers are women, which contribute to an average of more than 60% of the agricultural labour force in Tanzania (Ministry of agriculture food and cooperatives, 2012). They are the integral participants to the success of the agriculture sector (McCarney, 1991). Women smallholder farmers represent the majority of the rural poor population in developing countries (Rekha & Mary, 2008). As smallholder farmers, women play a great role in ensuring food is available at all the time in their households. They usually engage in subsistence farming to provide food for household consumption while men engage in cash or export crops. They dominate food production with labour contributions of 50–85% of the total agricultural labour (McCarney, 1991). Banana (2012) revealed that women's primary responsibility in Sub Saharan Africa is to feed the family and only after that they can engage in other income generating activities.

Despite the fact that women play a great role in ensuring food availability and accessibility at households, but they are faced with a number of significant barriers such as inequality in access to and control over inputs and resources such as land, labour, improved seeds, fertilizers, capital/credit and the like that could smooth their

effort in agricultural production and processing. They also face barriers in rural cooperative groups, access to extension education and training, improved technology and marketing services, (FAO, 1998). Action Aid (2011) reported that women are important as food producers, and that the development efforts that target food and agriculture must recognize the unique roles and constraints that face women. Banana (2012) also revealed that even though women provide the majority of labour in agricultural production, but their access to and control over productive resources is greatly constrained due to inequalities constructed by patriarchal norms.

Women smallholder farmers (WSFs) in Tanzania are engaged in subsistence farming, they are using simple agricultural production inputs and most of the time they depend on unreliable climatic conditions. Despite the role of WSFs in ensuring food security in Tanzania, many areas including the study area use to experiencing seasonal food shortage and WSFs' role in the economy has often been underestimated. Their work in agriculture has long been invisible since they often are not recognized as productive farmers, and rarely receive appropriate farming inputs, extension services, and training or benefit from new agricultural research and technologies. Women often are expected to provide unpaid farm work, and bear a disproportionate burden of care and reproductive roles within the family and the community (World Bank, 2010). In 2009 the Tanzanian government in collaboration with public—private partners established the program called "Kilimo Kwanza" in Swahili means "Agriculture First". The program uses National Agricultural Input Voucher Scheme (NAIVS) for supporting farmers, especially smallholder farmers in bringing a green revolution and also helping farmers to shift from subsistence to commercial farming. It has been established after failure of a number of programs aimed to support farmers. Similar to the previous program, this one also lacks means that directly target women smallholder farmers from those that have historically targeted men.

This paper aims to examine the constraints on women smallholder farmers' efforts in ensuring food security at the household level since we know that women are the key food producer and processor. They play a key role in food production and yet have less access to technology, inputs, education, labour, capital/credit than men do. The study also aims to identify women's potentials in ensuring food security and improving livelihoods at household level. The result will provide evidence to researchers, policy makers, the government and other development practitioners on the women potentials and constraints that hinder their efforts to be fulfilled. Then, appropriate measures must be taken into account for achieving food security and increasing food production at large.

1.1 Factors Contributing to Household Food Insecurity

Food production in many African countries is generally low since most of the farmers depend much on rain fed agriculture that is unpredictable and therefore food security is minimal (Sumaye, 1993; Mwaipopo, 2004). In countries like Tanzania, the main cause of food insecurity is climatic conditions due to the fact that rain-fed agricultural still dominate food production in the agricultural sector, but there are other factors such as insufficient supply and/or serious delays and uncertainty in the delivery of inputs for food production such as seeds, fertilizers, pesticides to farmers, use of poor technology, inflations, farmers low level of income and many more. Food availability depends much on production, trade and stock holding. Shortfalls in food production and/or in food availability through trade can lead to food insecurity due to price rises or a breakdown in distribution channels. (Yambi, Kavishe, & Lorri, 1990; Ndiyo & Urassa, 2001) pointed out that farmers may suffer from poor crop yield due to drought, floods, or pests either individually, at the village, ward, or Districts level. The poor weather conditions and natural hazards such as drought and floods contribute to low agriculture production. Inability to adopt new technology and fail to afford modern farming methods that can speed up agro products in the country such as the use of tractors while cultivating, and applying agro inputs all affects food production hence food insecurity. In addition to that, most of women smallholder farmers (WSFs) as the main producers lack enough capital to purchase agro inputs and adoption of new technology of farming which has a great effect on agricultural yields. Socio-cultural factors like traditions/customs and norms, especially in the division of labour overload women who are the main food producer since they use to spend most of their time on domestic activities/household chores such as taking care of their families rather than food production. Women also lack education concerning the aspects that influence the distribution of food and consumption patterns of household. The majority of poor people in developing countries lives in rural area and they depend much on agriculture as a source of food as well as the source of income. Unfortunately, rural sectors which are based on agriculture have been neglected and instead urban sector has been given priority which focuses on industrialization, also the little attention which agriculture has received, has focused on creating conducive environment for middle and large scale than smallholder farmers.

2. Materials and Methods

2.1 Description of the Study Area

The study was conducted in Morogoro region at Msowero ward, the ward is found in the eastern part of Tanzania. Agriculture is the main economic activity and the area is suitable for agricultural food production for a variety of cash and food crops. The ward comprises of five villages and sample was selected from all five villages namely Msowero, Mvumi, Mambegwa, Makwambe and Mhowe. Women are the major food producer and income earners in ensuring food security, but they are somehow ignored in agricultural extension education and other opportunities for development.

2.2 Data Collection and Analysis

2.2.1 Data Collection

The study has captured both types of data, primary and secondary data. Primary data were obtained from the field area, a structured interview supported by personal observations and discussion with key informants was used to collect primary data while secondary data were obtained from extension officer progressive reports, journals, and various documents from the village and ward office. A sample of 100 women smallholder farmers with an average of 20 respondents from each village was selected using multistage sampling technique, first stage was purposive sampling were the women smallholder farmer was selected, and then from there simple random sampling technique was used to select respondents. The respondents involved in the study include selected women smallholder farmers, both workers and non workers from all five villages in the study area, village chairpersons, Ward Executive Officer (WEO), Agriculture Extension Officer (AEO) as local government officers and Eastern Zone Irrigation and Technical Services Units (EZITSUs).

2.2.2 Data Analysis

The research employed descriptive and econometric techniques for analyzing data collected. Descriptive analysis was used to find out the frequencies, means, and minimum and maximum values with the help of SPSS 20 and MS-Excel. Food Security Index (Zi) was constructed and food security of each household was determined based on the food security line (daily calorie required). To set up food security status of women smallholder farmers, Food Security Index (Zi) was also formulated and rooted the food security status of each woman smallholder farmers based on the food security line using the Recommended Daily Calorie Required (RDCR) approach as used by Babatunde et al. (2007). Women smallholder farmers whose Daily Calorie Intake was the same or higher than Recommended Daily Calorie Required were considered food secure while those WSFs whose Daily Calorie Intake below the Recommended Daily Calorie required were considered food insecure. The Food Security Index (Zi) is specified as:

$$Z_i = \frac{Y_i}{R} \tag{1}$$

Where by: Z_i is the Food security status of ith households that takes 1 for food secured and 0 for food insecure households. Y_i is the Daily per capita calorie intake of ith household. R is the recommended per capita daily calorie intake (2260 kcal).

The logistic regression model was used to establish the constraints on women smallholder farmers in ensuring food security at households as a function of a set of independent variables/ determinants.

3. Results and Discussion

Table 1 below presents summary distribution of respondents' characteristics for selected samples of WSFs food security status with respective variables. The results show that most of WSFs (women smallholder farmers) food insecure households (69.6%), have primary level, are farmers (85.2%), either widowed (38.1%) or divorced (33.3%), have a high dependency ratio (64.3%) and small farm size (54.4%).

Table 1. Descriptive statistics

| Characteristics | Frequency (%) | | Mean |
	Secure 58%	Insecure 42%	
Education level			
None	0	9.3	2.35
Primary	41.3	69.6	
Secondary level	32.6	21.1	
Tertiary education	26.1	0	
Occupation			
Farmer	54.3	85.2	1.99
Farmer and Employed	26.1	0	
Farmer and Small Scale Business	14.8	19.6	
Marital status			
Single	27.6	9.5	2.51
Married	34.5	19	
Divorced	22.4	38.1	
Widowed	15.5	33.3	
Family size			
Less or equal to 5 people	63.8	35.7	1.64
More 5 people	36.2	64.3	
Farm size			
Less than 2 acreage	41.8	54.4	1.55
Less or equal to 5 people	58.2	42.6	

Source: Field survey March 2013–August 2013.

The study reveals that the socioeconomic status of WSFs households (Table 2) was generally low, and it has a direct impact on the food security status of the households. Most of the WSFs depend only on farming as their main source of income and food for consumption. They don't have other economic activities to boost up their earnings. In general, majority of WSFs in the study area was found to have small farm size, low level of education, large family size and were more likely to experience any kind of household food insecurity. Previous studies consistent with this says, variables related to socioeconomic status of households such as low level education, large family size and so on contribute to food insufficiency among the households (Lino, 1996; Sharif & Ang, 2001; Ferdoushi & Chamhuri, 2013). Women have a lower socioeconomic status, compared to their male counterparts, which limits their opportunities to access and participate in formal groups (Woldu, Tadesse, & Waller, 2013).

Table 2. Socioeconomic status of WSFs households

Category	No.	%
High socioeconomic status	21	21
Middle socioeconomic status	32	32
Low socioeconomic status	47	47
Total	100	100

Source: Field survey March 2013–August 2013.

The results in Table 3 for food security indices were based on the recommended daily calorie intake (R) set by FAO of 2260 kcal, it was observed that the average per capita calorie intake in the area was 2182kcal. Average per capita calorie intake for WSFs who are food secure were 3145 kcal with 1421 kcal for WSFs who are food insecure. The results also find out that only 39% of the population was able to meet the recommended per capita calorie intake throughout the year, 33% can meet the recommended calorie intake of 2260 kcal seasonally while 28% cannot either. Furthermore, 15.9% of WSFs who are food secure and 46.8% of WSFs who are food insecure have under five years' old children. The average household size was 6 persons, while for food insecure households were 9 persons and 5 persons for food secure households.

Table 3. Summary of WSFs food security indices in the study area

Variables	Food secure	Food insecure	Total
Number of households	58	42	100
Respondents' household (Adult %)	58	42	100
Percent of households with U5 year's children (%)	15.9	46.8	14.6
Average households/family size.	5.41	8.63	6.12
Food security I*ndex (Z_i)*			
Mean	1.56	1.27	1.42
Standard Deviation	0.502	0.449	0.496
Average per capital intake.	3145	1421	2183

Source: Field survey March 2013–August 2013.

A logistic regression model was performed to determine the constraints toward the WSFs effort in ensuring food security at household level. The results as presented below in Table 4 shows the estimated value of the coefficient of the model (B), Wald (χ^2), Sig., and Odds ratio (Exp B) of variables.

It showed that family size, access to resources such as land and capital and agro-inputs like pesticides when needed, access to modern technology like irrigation services and extension education/ training, participation in rural women's co-operative group in the area and the cost of food production were significant, indicating the constraints towards the WSF effort in ensuring food security at household level in the study area.

Family size: The investigation finds out that this variable has a negative coefficient significant at the 5% level ($p < 0.05$), implying that an increase in family size, decreases the probability of the household being food secure, ceteris paribus, and hence it constrains the WSF effort towards ensuring food security at households. The results show that 26 out of 35 households with more than 5 people in their households do face food shortage during off harvest season; this is approximately equal to 74.3%, while 12 out of 39 households with between 3–5 people which approximately equal to 30.7% do face food shortage. The analysis reveals that for an additional family member in a given household in the area leads to decrease (by 17.4%) in the amount of calorie intake. Also the bigger the female- headed or unmarried women's families that also comprise of children and elders were reported to be at high risk of food insecurity compared to male-headed families (married women), except for families with energetic and active members the situation was different. Families with energetic and active members (excluding elders and children) were more advantageous as they can offer farm labour in the household and to other people to get income on a cash basis. This result is in line with Netsanet (2009) and Berhanu (2011) showed that, poverty in the female-headed households have a direct relationship with household size. According to the world report study conducted in Tanzania (World Bank, 2000; Setotaw, 2006), farm households with large family size and women-head had significantly lower levels of food security.

Access to resources such as Land and Capital: As far as the results are concerned, this variable was positive and statistically significant at the 5% level ($p < 0.05$). This implies that a percentage increase in access to resources such as land, capital increases the chance of the household being food secure by 3.448 times than the food insecure household, ceteris paribus. This means that the inability to access to resources such as land and capital constrain WSF effort towards ensuring food security at households. The study also finds out that the majority of smallholder farmers have few assets and they only depend on land as collateral for capital/credits. Moreover, even though discrimination in land and property rights based on sex or religion is prohibited by the Tanzanian constitution, but customary law limit women's rights, they are given access to family or communal land whereas their rights can be deprived in the course of divorce or widowhood. Consistent with that, Tegegne, (2012) finds out that in Ethiopia women's access to land was limited, and they depend upon their marital status, i.e., access to land was granted only through marriage since most of the women in the study were married and are entitled to their husband's land. Interviewed women said that they cannot apply for loans (capital) from banks or other financial institutions because of a number of obstacles like high interest rate, limited amount of loan that can be applied, collaterals barrier and short period for repaying the loans. Eriksen (2008) revealed that demand for collaterals and/or guarantors, high interest rate, tightness of the deadlines for repaying the loans, frequency of repayment schedules, the rigorous procedures for obtaining loans as well as restrictions on the amount of loan allowed are among obstacles on the way to credit services for women in Addis Ababa.

Access to agricultural inputs like seed, fertilizer and pesticides when needed: The coefficient of agro-inputs like seeds, fertilizer, pesticides is also positive and significant at the 5% level ($p < 0.05$) which indicate that a percentage increase in access to agricultural inputs like seeds, fertilizers and pesticides to WSFs increases the

probability of a household being food secure. WSFs efforts are constrained by their inability to access agricultural inputs like seed, fertilizer and pesticides when needed. This was consistent with the study from Kenya, which revealed that female headed households have much lower adoption rates for improved seeds and fertilizers. Credit constraints also limit the access of female-headed households to fertilizers in Benin and Malawi (Minot, Kherallah, & Berry, 2000). Ndiyo and Urassa (2001) also finds out that women smallholder farmers' access to agricultural inputs and technologies is constrained by their lack of access to credit and membership in rural organizations, gender-blind development programs and lack of attention to the needs of women farmers in research. Despite the fact that new established agricultural program in Tanzania called 'Kilimo Kwanza' means 'agricultural first' in Swahili targeted the area where rice farmers have access to irrigation, and maize and/or rice production regions, data from Zone Irrigation and Technical Services Units (ZITSUs) revealed that few of the WSFs benefits from irrigation services, most of the beneficiaries are men (62 women by 111 men in the study area).

Modern technology and Agricultural extension education/ training: The results show a positive and significant coefficient at the 5% level ($p < 0.05$) of access to Modern technology and agricultural extension education/ training to WSFs. This implies that a percentage increase in access to modern technology and agricultural extension education/ training to WSFs (ceteris paribus) increases the probability of being food secure and hence reduce constrain toward their effort in ensuring food security at households. Mechanized farming not only enables efficient utilization of various inputs such as fertilizers, pesticides, seeds, and use of water for irrigation, but also helps in improving yields and hence poverty alleviation. The majority of women smallholder farmer's are still practicing rudimentary farming, farming activities are done manually, which is time-consuming, since they can't afford to hire tractors/new technologies for food production (as to out 173 beneficiaries, only 62 are women while 111 are men). Furthermore, women are not only a key producer of food, but they also perform household chores, most of the time they do not have enough time to attend extension education/ training programs for existing/new technologies. A study by Tegegne (2012) in Ethiopia revealed that 29.4%, of women had training on agricultural technologies, 50.3% had no training in agricultural technologies and 20.3% partially participate in training on agricultural technologies. This tends to constrain woman's farmers' ability to improve yield, earnings and efficiency in agriculture.

Cost of food production: This variable was significant at the 5% level ($p < 0.05$). It has a negative coefficient (-1.516) which implies that an increase in the cost of food production decreases the probability for the household to be food secure. The study revealed that WSFs in the study area has no or little access to credit and agriculture incentives which can help them to engage in sustainable agricultural practices, since without credit farmers cannot manage to buy inputs such as seeds, fertilizers, hire labour force and adopt improved technologies. High cost of food production especially in the farm inputs, technology, labour force, transport and changes in weather conditions for rain-fed agriculture, influence demand and supply for food products, and are still the key determinants of agricultural prices. WSFs are more affected with the high cost of production due to the fact that they rarely access credit and also most of them fall under the low socioeconomic status category in the study area, so they cannot afford farming expenses especially hiring labour force, new technology, inputs and so on. The cost of production, storage and distribution of food items is expected to be high which will have a negative impact on food security at household as well as national level (Ferdoushi & Chamhuri, 2013).

Other variables:

Food storage facilities: This variable has a positive coefficient that was significant at the 10% level ($p < 0.1$), which means that the use of poor food storage facilities increase the probability of being food insecure and vice versa. Poor food storage facilities and use of poor processing methods constrain WSFs efforts in ensuring food security at households, this is due to the fact that it leads to high post harvest losses of food and hence food insecurity. In line with this study Imonikebe (2010) pointed out that the provision of processing and storage facilities by the government could minimize post harvest losses and promote food security. WSFs plays a greater role in every stage of food production, so in order to reduce food waste women should be empowered so that they can access modernized food storage facilities and food processing methods.

Earning per month: WSFs households earning per month has a positive coefficient but was not significant. The result was against the expectation, this could be due to fact that most of the WSFs didn't know exactly what they earn and others didn't want to tell the truth about their earnings. Most of the WSFs in the study area rely on agriculture as their main income generating activity and food source, but they grow their crops in less than two hectares of land and they still practice a rudimentary farming approach which is time consuming and can lead to a lot of food losses. Normally WSFs in the study area depend on subsistence farming alone, they lack diversification alternatives/activities they lack opportunities, knowledge about techniques and/or innovations so

as to maximize their income through farming and non-farm activities. This finding is consistent with Mwaipopo (2004) who find out that there are few other income generating options currently exist for women that can be carried out in the village, as compared to men who can work outside the village and migrate for work.

Rural co-operative group in the area: Coefficient for this variable was positive but not significant to the model. This result was contrary to the expectation, this could be due to the fact that there are few co-operative groups in the area, and they also lack proper information about the importance and benefits they can get from their participation in a rural co-operative group. Despite the fact that WSFs' participation in a rural co-operative group increases the probability of their household being food secure since it holds much potential for socially and economically poor farmers, few of them do participate. When WSFs' access to or participation to rural cooperative groups is restricted, their ability to make their views and opinions known to policy makers and development planners is restricted, which will obviously constrain WSFs to carry out their roles in agriculture and food security. Only 14% of the interviewed WSFs were members of the rural cooperative group in the study area, most of them were female household heads, more educated and unmarried women. In line with this a study Oxfam International (2013) and Thomas et al. (2006) found that older, wealthier, those received education, unmarried, female household heads are more likely to be members of agricultural cooperatives as compared to other women.

Table 4. Estimates of logistic regression of determinants constraints to WSFs in ensuring food security Women's potential in ensuring food security at household level

Variables	Coefficient	Wald	Sig.	Exp (B)
Family size.	-1.749	3.897	.048**	.174
Earning per month.	1.358	2.582	.108	3.889
Resources such as land and capital.	1.566	6.397	.011**	4.788
Agro-inputs like pesticides when needed.	1.588	5.755	.016**	4.892
Modern technology and agricultural extension education/ training.	1.385	3.968	.046**	3.993
Rural co-operative groups in the area**.**	.516	.515	.473	1.675
Food storage facilities.	1.221	3.249	.071*	3.390
Cost of food production.	-1.516	5.802	.016**	.220
Constant	-8.019	5.652	.017	.000

Note. Dependent variable Asterisks **p < 0 .01 and *p < 0 .01. Source; Field survey March 2013–August 2013.

Women smallholder farmers usually play multiple roles as farmers, entrepreneurs, food producers and providers and also they perform household chores. The analysis on the women's potential in ensuring food security at household level in Msowero ward has shown that though they play great roles in ensuring food security at all levels, many households headed by women were food insecure. Low purchasing power, lack of the employment, lack of access to resources, land, credits, inputs, extension education/ training and modern technology that could assist in food production were the main constraints toward their efforts. They need control and access to services that could make the implementation of their daily activities especially food production activities smoothly. They need financial support, easy access to credit that could assure them of better seeds, fertilizers, timely crop plantation, increase their yields and finally they can be able to sell their surplus at a better market price. Also the Government in collaboration with other development practitioners could help them to access irrigation services, to build food storage facilities for surplus production, establish food processing industries so as to add food value and reduce food waste, build better roads and transportation infrastructure to improve food distribution from farm to market, and find the market for their surplus. All these services are important to smallholder farmers in rural areas like Msowero ward because it will reduce barriers preventing smallholder farmers especially rural women in fulfilling their potential as food producers, farmers and/ or entrepreneurs that also hinder their efforts in ensuring food security at all levels. The results from the study area conclude that age of household heads, education level, family size, farm size and household income are the most important factors explaining determining women's potential in ensuring food security.

4. Conclusion and Recommendations

The constraints discussed in this paper are some of the key aspect that decelerates the progress of women smallholder farmers (WSFs) towards success. The study showed that even though WSFs play a great role in ensuring food security at households, they are faced with a number of constraints which restrain their efforts.

WSFs do participate in farming, supply a large percentage of the labour force (more that 80%), participate in local food processing activities, and household chores. But they're the more constrained group, since they lack access to potential services which could smooth their agricultural production activities, most of them are illiteracy which restrain their ability to demand for appropriate services when needed, also it act as a barrier for them to adopt new technologies which might help them to increase productivity hence improve food security for their households. WSFs as a key food producer not only needs access to agricultural production resources and supporting services, but also control over resources that could help them in food production process so that to abolish male- centered production systems at the expense of women's effort. Furthermore, having few WSFs that participate in rural co-operative groups in the area is in one way or another result of traditional practices, lack of information about the presence/benefits or importance and/or lack of motives to join the group.

For the government and development practitioners, they should consider these constraints to WSFs while making policies and developing various plans for development like "Kilimo Kwanza" agriculture first' for green revolution since most of the plans and programs are "Gender blind", they don't consider the importance of WSFs in bringing about changes to the agriculture sector in the Country. Therefore:

1) WSFs should be empowered so to increase their chances to access resources and various services for agriculture and food production.

2) They should be policies that might favour WSFs and enable them to compete with men in various fields especially the field of agriculture.

3) The WSFs illiteracy rate should be reduced, this is the serious issue which could help them to demand for their right in the case, adopt new technology when arise and participate in decision making.

4) Consideration of WSFs in various programs established should be taken seriously.

5) Though customary laws of Tanzania have the same status in the courts, something must be done by elders and local leaders so as it can give equal chance to both men and women in case of property inheritance.

However, it is important to be aware of the role played by women smallholder farmers and the constraints they encountered, subsequently to establish a number of policies and provide with assistance to assist them in ensuring food security and improving livelihoods at households and moreover, reducing the economic and social gap between men and women in all over the entire world.

Acknowledgement

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Foreign Direct Investment, Intellectual Property Rights and Economic Growth: A Panel Study for Arabic Countries

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Abstract

The main purpose of this paper is to examine the role of the protection of intellectual property rights (IPR) in Arab countries to encourage developed countries to transfer their technologies to Arab countries and its impact on economic growth using panel data of seven Arab countries in terms of patent protection, foreign direct investment (FDI) and the specific characteristics of each country for the period 1970–2011. The results of our simultaneous equations model suggest that FDI affects negatively growth in total factor productivity (TFP). They show that IPR protection stimulates TFP growth by attracting FDI and technology flows.

Keywords: protection of intellectual property rights, foreign direct investment, economic growth

1. Introduction

The potential role of IPR in technology transfer through FDI is a relatively new topic of research. Few theoretical studies have examined the nature of the relationship between IPR protection and FDI. They show a strengthening of IPR improved incentives for innovation in developed countries if this building would increase FDI (Lai, 1998). Some empirical studies have come to highlight a significant relationship between IPR protection and FDI (Lee & Mansfield, 1996; Maskus, 1998; Park & Lippoldt, 2008).

The main purpose of this work is to study the role of IPR in technology transfer through FDI and economic growth in the case of Arab countries. Note that the relationship between IPR protection, FDI and economic growth are still poorly understood , particularly in the case of developing countries. On the one hand, some studies are conducted around the links between FDI and economic growth in a host country by ignoring the role of IPR protection (Blomstrom et al., 1994; Borensztein et al., 1998; Balasubramanyam et al., 1999; Xu, 2000; Lee, 2001). On the other hand, a limited number of studies have examined the relationship between IPR protection and economic growth while ignoring the role of FDI (Gould & Gruben, 1996; Park & Ginarte, 1997; Xu & Chiang, 2005; Falvey & Foster, 2006). The results of these studies are ambiguous.

Compared to the literature, this work aims to estimate the effects of IPRs on technology transfer through FDI and economic growth in the case of Arab countries using a two-equation model. Studies on the effects of IPR protection using a two-equation model are sparse and inconclusive in the case of developing countries. Park and Ginarte (1997) investigated the role of IPR protection in the accumulation of factors of production and economic growth. Xu and Chiang (2005) studied the role of IPR protection in technology transfer through the flow of foreign patents and economic growth.

To investigate the relationship between the IPR protection and economic growth on the one hand and between the IPR protection and FDI on the other hand, we will proceed as part of this work, a two-equation panel model for a sample of seven Arabic countries over the period 1970–2011.

The rest of the paper is organized as follow. In section 1, we review the empirical literature on the relationship between the IPR protection and economic performance. Section 2 discusses the empirical set-up of our model, the data employed and the results. In section 3, we summarize our results and provide concluding remarks.

2. Review of the Empirical Literature

While theorists are still far from complete work on the issue that focuses on channels through which the IPR

protection influence and can influence the economic sphere.

Several empirical studies have emerged, with the aim to provide additional arguments to the controversial association between IPR protection and economic performances. In what follows we will, move to a review of the empirical literature on the subject.

2.1 Technology Transfer Related to FDI and Economic Growth

The new growth theory has highlighted the key role of technology transfer through FDI in accelerating growth in developing countries. More particularly, according to the model of Borensztein et al. (1998), the introduction of capital goods accounted for by the presence of the flow of FDI leads to technical progress, the source of economic growth. According to this model, FDI is a means of transmission of knowledge production and dissemination of new innovations and new methods of production, thereby lowering costs borne by domestic producers.

However, according to some studies, the volume of broadcast technology in the host country is generally influenced by its absorption capacity. Indeed, the role of FDI in improving productivity will be more important in a country with higher absorption capacity where local firms are able to absorb new technologies transferred and apply new techniques acquired production.

A first group of studies consider that the contribution of FDI to growth is enhanced by the level of development of the host country (Blomstrom et al., 1998; De Mello, 1999). They show that the effect of FDI is more important for developing countries with high incomes. In other words, there is a minimum level of income below which FDI has no significant effect on growth.

A second group of empirical studies show that FDI contributes to the economic growth of developing countries that if they have a minimum stock of human capital that enables them to use the technology diffused (Borensztein et al., 1998; Xu, 2000; Lee, 2001). Indeed, they show that for developing countries, a minimum threshold of human capital is required to benefit from FDI and more accurate way to benefit from foreign technology. However, the majority of developing countries have not reached this threshold.

A third group of empirical studies indicate that the presence of a sufficient degree of openness in the host country is a key factor for successful technology transfer and diffusion favored by FDI techniques. In other words, trade policies in the host countries appear to affect the magnitude of the induced growth of FDI since there is a link between trade regimes and economic growth in the long term (Balasubramanyam et al., 1996; De Mello, 1997).

2.2 The Relationship between IPR Protection and Economic Growth

A limited number of empirical studies have examined the relationship between IPR protection and economic growth. Their results are mixed.

According to Gould and Gruben (1996), IPR protection stimulates economic growth if it is accompanied by a policy of trade liberalization. The authors have demonstrated a positive and significant effect of IPR protection on economic growth for all developed countries and developing countries. More specifically speaking, the authors show that the effect of IPR protection is more important for relatively open economies. By encouraging initiatives to innovate, IPR protection may influence the growth of an open country.

According to Park and Ginarte (1997), IPR affect economic growth indirectly by stimulating the accumulation of factors of production such as physical capital and R&D capital. In fact, Park and Ginarte (1997) indicate that the IPR indicator has a direct and non-significant effect on the GDP per capita growth rate for a sample of developed and developing countries over the period 1960–1990. Their results show that IPR protection encourages the research sector to invest and take risks. This consequently stimulates economic growth.

The empirical results of Xu and Chiang (2005) show that IPR protection affects economic growth indirectly by attracting flows of foreign patents. At first, the authors considered the inflows of foreign patents as a determinant, among others, of the rate of growth of total factor productivity (TFP) of a country. In a second step, the authors consider the system of IPR protection and trade openness as determinants of inflows of foreign patents in a country to the extent that the decisions of foreign inventors to patent in a country are associated with their commercial activities in the country.

According to other studies, IPR protection stimulates economic growth of a country based on a certain level of development. The effect of IPR protection on the growth rate of GDP per capita is positive and statistically significant only for developed countries (Thompson & Rushing, 1996).

Other studies found that the relationship between IPR protection and economic growth is nonlinear. It depends upon the level of development of a country as well as the structure of its economic defined by the share of

manufacturing value added in GDP and the degree of openness (Falvey et al., 2004; Falvey & Foster, 2006).

2.3 The Relationship between IPR Protection and FDI

According to the theory, a strengthening of IPR protection in the South would improve the incentives for innovation in the North if the transmission channel of production from North to South is the FDI. Strengthening IPR protection is interpreted as incentive given by the South to encourage Northern FDI (Lai, 1998).

Specifically, Lai (1998) indicates that the effects of strengthening IPR protection in the countries of the South on the pace of innovation, on the transfer of production and on relative wages depend on the transfer channel production North to South.If the transfer channel production is imitation, stronger IPR protection in the South decreases the rate of innovation, the rate of product transfer and the relative wage in the South. The effects go in the opposite direction if the transfer of the production takes place through FDI. If the transfer of production from North to South is via imitation, stronger IPR protection has two opposing effects. On the one hand, it reduces the rate of imitation in the South and extends the duration of a monopoly of each innovator in the North. That's increases the returns to innovation. On the other hand, the increase in production in the North stimulates the demand for Northern labor and increases the relative wage. Therefore, the cost of innovation increases thus reducing the profit earned by each innovator. Ultimately, the second effect outweighs the first and the rate of innovation declines.

If the transfer of production from North to South is via FDI, strengthening IPR protection in the South has the effect of increasing the rate of innovation in the North and to encourage the transfer of Production from North to South. Indeed, following the increase in monopoly power, the returns to innovation increases without increasing costs. Northern firms will locate in the South, which reduces the demand for labor in the North as well as costs.

Empirically, some studies show a significant relationship between IPR protection and FDI. IPR protection is likely to influence not only the volume of FDI but also the quality of FDI (Lee & Mansfield, 1996; Seyoum, 1996; Maskus, 1998; Smarzynska, 2004). Theses studies have not linked the effects of IPR on FDI to long run growth.

Seyoum (1996) finds that IPR protection is significant in explaining FDI. For a sample of 27 countries studied over the period 1975–1990, the author observed a positive effect of IPR protection on total FDI flows. However, this effect is not significant in developing countries. In contrast, Maskus (1998) finds that IPR protection has a positive impact on the FDI stock held by U.S. firms in the case of developing countries.

Lee and Mansfield (1996) show a positive correlation between the strengthening of IPR protection and the flow of inward FDI in a host country. The authors tested the relationship between the volume of U.S. outward FDI flows in 14 countries (mainly in South America countries and the South East Asian countries). They find that the coefficient on IPR protection is positive and statistically significant implying that strong protection can attract more FDI. In addition, they emphasize the existence of a link between IPR protection and composition of FDI. Their study shows that the technology intensity of FDI tends to increase the effectiveness of anti-counterfeiting legislation in the host country. This result is confirmed by the study of Smarzynska (2004) which showed a significant effect of weak IPR protection on the composition of FDI flows. It discourages foreign investment in sectors with high technological intensity.

Similarly, Park and Lippoldt (2008) show, other things being equal, that IPR significantly and positively influences the stock of direct investment received by developing countries. Their work, conducted for a panel of developing countries over the period 1990–2005 also shows that IPR attract foreign direct investments in technology-intensive sectors (such as chemicals and machinery) .

3. Methodology

3.1 Empirical Strategy

The model that we aim adopt comprises two equations that will be estimated simultaneously. The first equation explains the growth rate of TFP. The second equation shows the relationship between FDI and IPR protection. In the model, the IDE will be an endogenous variable in the second equation and appear as an exogenous variable in the first equation. IPR protection will be a common predictor for both equations. The empirical analysis uses a panel data set consisting of nine periods 1970–1974, 1975–1979, 1980–1984, 1985–1989, 1990–1994, 1995–1999, 2000–2004, 2005–2009 and 2010–2011. The model is estimated in a first time for a sample of seven Arab countries and Iran is added in a second stage. The sample of Arab countries including Egypt, Iraq, Jordan, Mauritania, Morocco, Saudi Arabia and Tunisia. The estimation period is 1970–2011.

Equation 1: Equation of TFP growth

The first equation explains the growth rate of TFP. It is built from the growth models that estimated the effect of FDI (Borensztein et al., 1998). It is also enriched by models that introduce the effect of IPR protection (Park & Ginarte, 1997, Gould & Gruben, 1996).

It is assumed that FDI, human capital, IPR protection and the initial technological level are determining the rate of TFP growth of a developing country and that a developing country starts with a low level of technology. The initial technological gap between developed countries (source of direct investment) and the host country is large. Thanks to technology transfer through FDI, it is expected that the developing countries will grow at a faster rate, which would imply some form of convergence. However, this process of convergence is conditional, so that the growth rate depends, given an initial technological gap, on national policies and other variables that influence the growth rate of the host country. To test the convergence hypothesis, the majority of empirical studies introduce a measure of the initial situation in their growth regressions. Thus, the first equation can be written as follows:

$$GTFP_{it} = \alpha_0 + \alpha_1 \log(y_0)_{it} + \alpha_2 \log(ayss)_{it} + \alpha_3 \log(IDE)_{it} + \alpha_4 \log DPI_{it} + \varepsilon_{it} \quad (1)$$

with: i mean a country, t means the period of time; GTFP is the average growth rate of TFP of a country calculated on periods 1970–1974, 1975–1979, 1980–1984, 1985–1989, 1990–1994, 1995–1999, 2000–2004, 2005–2009 and 2010–2011. Log (y_0) is the logged level of per capita GDP at the begging of each period. Log (ayss) is the logarithm of average years of secondary schooling for people over 15 at the begging of each period. log (FDI) is the logarithm of the average ratio of net inflows of foreign direct investment in GDP. Log (IPR) is the logarithm of the Park and Ginarte indicator of IPR defined for the initial year of each period, ε is an error term.

The first equation differs from the existing literature by estimating a growth regression where FDI and IPR protection are introduced simultaneously.

Equation 2: Relationship between FDI and IPR

The second equation explains the FDI IPR protection in the host country. It is built from models of Park and Lippoldt (2008) and Lee and Mansfield (1996). It is also assumed that the developing country' attractiveness of FDI depends on the level of its human capital and its economic stability. The latter manifests through inflation with an expected adverse effect.

This effect is the loss of competitiveness of the host country of FDI, thus discouraging foreign investors. In addition, civil liberty is assumed crucial in attracting FDI. The second equation is:

$$\log(FDI)_{it} = \beta_0 + \beta_1 \log(IPR)_{it} + \beta_2 \log(atys)_{it} + \beta_3 civ.libe_{it} + \beta_4 inflation_{it} + \varepsilon'_{it} \quad (2)$$

where: i denotes a country and t denotes the time period, variables log (FDI) and log (IPR) have the same definitions as in Equation 1. Log (atys) is the logarithm of average years of total schooling for people over 15 at the begging of each period.

Civ.lib is the average of the indicator of civil liberty calculated on periods 1970–1974, 1975–1979, 1980–1984, 1985–1989, 1990–1994, 1995–1999, 2000–2004, 2005–2009. It's defined at the begging of period 2010–2011. Inflation is the average rate of inflation (measured by the GDP deflator). ε' is an error term.

We also consider an alternative specification in which we include freedom status in place of civil liberty. The third equation is:

$$\log(FDI)_{it} = \beta_0 + \beta_1 \log(IPR)_{it} + \beta_2 \log(atys)_{it} + \beta_3 freedom_{it} + \beta_4 inflation_{it} + \varepsilon'_{it} \quad (3)$$

Freedom is is the average of the indicator of freedom status calculated on periods 1970–1974, 1975–1979, 1980–1984, 1985–1989, 1990–1994, 1995–1999, 2000–2004, 2005–2009. It's defined at the begging of period 2010–2011. The indicator is the average of two variables « civil liberty» and "private property".

Finally, our model is written as follows:

$$\begin{cases} GTFP_{it} = \alpha_0 + \alpha_1 \log(y_0)_{it} + \alpha_2 \log(ayss)_{it} + \alpha_3 \log(FDI)_{it} + \alpha_4 \log IPR_{it} + \varepsilon_{it} \\ \log(FDI)_{it} = \beta_0 + \beta_1 \log(IPR)_{it} + \beta_2 \log(atys)_{it} + \beta_3 Civ.Lib_{it}(freedom_{it}) + \beta_4 inflation_{it} + \varepsilon'_{it} \end{cases}$$

Since all equations are over-identified, the model is over-identified. It is estimated by the method "Seemingly Unrelated Regressions (SUR)".

3.2 Data Sources

Data on TFP and per capita GDP are from Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2013), "The Next Generation of the Penn World Table". We use the index of patent rights developed by Park and Ginarte (The authors think Walter Park for providing updated data on the IPR index). This index is based on five categories of patent laws: extend of coverage, membership in international patent agreements, provisions for loss of protection, enforcement mechanisms and the duration of protection. Average years of secondary schooling for people over 15 and average years of total schooling for people over 15 are from Barro and Lee (2011). Data on ratio of net inflows of foreign direct investment in GDP and inflation was down from World's Bank's World Development indicators (2013). Data on civil liberties and freedom status are from Freedom House (Freedom in the World Country Ranking 1972–2011).

3.3 Empirical Results

Tables 1 and 2 show the results of estimating the model for the first sample (Arab countries) and for the second sample (Arab countries and Iran). In the last two regressions in Table 1, the variable civil liberty is replaced by the variable "freedom".

Note that the coefficients are elasticity that are interpreted as relative changes that provide information on the variation dependent variable following a unit change in the variable in question.

The results in Table 1 show that:

- The coefficient of initial GDP per capita is negative in all equations and statistically significant. Suggesting a convergence of the sample countries, that growth is accelerating away from the stationary state is slowing and in reasonable proximity thereto.

- The effect of human capital (average years of secondary schooling) on TFP growth has the expected positive sign and is statistically significant at the 1% level.

- Foreign direct investment has negative influence on the economic performance of these countries in most cases. This can be explained by the fact that the conditions inside the host country may appear predetermining both in the ability to attracting FDI with a chance to transform the specialization of the host country and the implementation mechanisms of overflow in the local production. Indeed, with, among others, inadequate basic infrastructure, a poorly qualified workforce, industries disarticulated, FDI only amplify the dependence of these countries to strangers.

- IPR positively influences economic growth in these countries, because its coefficient is always positive and statistically significant indicating a dominant effect on economic growth. This result is consistent with Gould and Gruben (1996)' work which reports a positive and significant effect of IPR protection on GDP growth using a measure of IPR protection based on that of Rapp and Rozek (1990).

Table 1. TFP growth regressions

	Dependent Variable TFP growth rate(1970–2011)			
	Arab countries	**Arab countries and Iran**	**Arab countries**	**Arab countries and Iran**
Variables Explicatives	**(1)**	**(2)**	**(3)**	**(4)**
log (y_0)	-0.0266***	-0.0310***	-0.0260***	-0.0301***
	(-3.18)	(-3.87)	(-3.10)	(-3.75)
Log (ayss)	0.0346***	0.0320 ***	0.0338 ***	0.0311***
	(3.12)	(3.04)	(3.04)	(2.95)
Log(FDI)	**-0.0248 ***	**-0.0185 ***	**-0.0243 ***	**-0.0180***
	(-5.09)	**(-4.60)**	**(-4.99)**	**(-4.47)**
Log(IPR)	**0.0343**	**0.0282**	**0.0340 **	**0.0279**
	(2.51)	**(2.04)**	**(2.49)**	**(2.02)**
Constante	0.3099 ***	0.3173***	0.3031**	0.3080***
	(4.52)	(4.71)	(4.41)	(4.57)
Chi2	42.58***	39.17 ***	40.83 ***	36.86***
R^2	0.3886	0.3092	0.3860	0.3130
Observations	50	56	50	56

Note. t-statistics are in parentheses. ***,** and * indicate statistical significance at the 1%, 5% and 10% levels respectively. Estimation is by Seemingly Unrelated Regression. Equation in column x is jointly estimated with equation corresponding to column x's of table 2, where x=1, 2, 3, 4).

Table 2. Relationship between FDI and IPR

Dependent Variable: FDI net inflows (% GDP),1970–2011				
	Arab countries	**Arab countries and Iran**	**Arab countries**	**Arab countries and Iran**
Explicatives Variables	**(1)**	**(2)**	**(3)**	**(4)**
Log(IPR)	**0.7483 ****	**0.7799****	**0.8927****	**0.9311****
	(2.15)	**(2.06)**	**(2.52)**	**(2.42)**
Log(atys)	0.8920***	0.7218**	0 .8882 ***	0.7149**
	(2.69)	(2.12)	(2.58)	(2.03)
Civ. lib	-0.5224**	-0.5565**		
	(-2.47)	(-2.45)		
Freedom			-0.3845*	-0.4061*
			(-1.77)	(-1.72)
inflation	-0.0287	-0.0649***	-0.0372	-0.0780***
	(-1.05)	(-2.63)	(-1.35)	(-3.25)
Constante	6.0682***	6.7289***	5.4348***	6.0626***
	(5.54)	(5.82)	(4.83)	(5.05)
Chi2	25.39***	33.35***	21.36 ***	29.06***
R^2	0.3189	0.3481	0.2845	0.3210
observations	50	56	50	56

Note. t-statistics are in parentheses. ***, ** et * indicate statistical significance at the 1%, 5% and 10% levels respectively. Estimation is by Seemingly Unrelated Regression. jointly with TFP growth equation.

The results in Table 2 show that:

- The coefficients associated with the variable IPR are positive and statistically significant at the 5% level. Suggesting a positive effect of this variable on the net inflows of FDI in the countries of our samples. The results are supportive of the theory that IPR protection is a major factor attracting FDI inflows (Lai, 1998). They are also consistent with work by Maskus (1998) who finds that IPR protection has a positive impact on the FDI stock held by U.S. firms in the case of developing countries and work by Park and Lippoldt (2008) who find the IPR protection is an important determinant of the stock of direct investment received by developing countries.

- As expected, human capital (average years of total schooling) has positive and statistically significant effect on FDI inflows in all the regressions.

- The coefficients associated with the variable inflation are negative and statistically significant, because this variable is considered a measure of "financial repression", where most studies have shown its negative impact on economic growth and on national and international investment via its effect on profitability.

- The variables "civil liberties" and "Freedom Status" seem to be negatively correlated with FDI in these countries. This finding is not surprising because the countries of our samples are "partly free" or "Not free".

Result, which can find an explanation which states that on the one hand, the political institutions will have an indirect effect on economic growth, an effect that passes through investment and human capital in particular. On the other hand, a unwell political and institutional environment do not attracts foreign investors as it contributes to the fruitlessness of their projects, because the conditions inside the host country may appear predetermining both in the ability to attracting FDI with a chance to transform the specialization of the host country and the implementation mechanisms of overflow in the local production.

4. Conclusion

As part of this research, we tried to help resolve the fundamental question: What is the nature of the relationship between technology transfer through FDI and IPR protection in an Arab country?
To do this, we used a simultaneous equations model covering a sample of seven Arab countries and next a sample of Arab countries and Iran during the period 1970–2011.

The key findings emerged from this empirical analysis show:

- A positive effect exerted by the IPR on TFP growth.

- A positive effect exerted by the IPR on FDI.

First, the results appear to confirm that IPR protection is a key determinant of PTF growth and it is consistent with the findings in Gould and Gruben (1996). Second, IPRs affect economic growth indirectly. This result is in accordance with the results in Park and Ginarte (1997) who have demonstrated that IPRs affect economic growth indirectly by stimulating the accumulation of factors of production such as physical capital and R&D capital. Similarly the Xu and Chiang (2005)' study that has show that IPR protection affects economic growth indirectly by attracting flows of foreign patents. Third, IPR protection tends to attract more FDI inflows. This is consistent with early findings in other studies by Lee and Mansfield (1996); Maskus (1998) and Park and Lippoldt (2008).

In general, the results of these econometric studies consolidate the results already obtained by several researchers in this field.

We conclude, without confirming that these analyzes have allowed us, even in part, to show the existence of a relationship between IPR, FDI and economic performance. However, it is important to note that despite the importance of empirical results which leads this work, deficiencies may arise:

- Other possible mechanisms of the relationship under study were not considered.

- Lack of data made our sample small.

The relationship between IPR, FDI and economic performance could be better understood once its underlying mechanisms are still being analyzed and these shortcomings are remedied.

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Specificity of the Culture of Governance in the Mediterranean Arab Countries: A Principal Components Analysis

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Abstract

The purpose of this paper is to study the specificity and dynamics of governance culture in the Mediterranean Arab countries. We rely on the notion of governance developed by Meisel and Oueld Aoudia (2007) "Governance for Development" and we use the "Institutional Profiles" database for the years 2001–2006 and 2009. We accomplish a principal component analysis and we show that the institutions of governance prevailing in the Mediterranean Arab countries are not institutionalized and are dominated by interpersonal and informal arrangements. They are also characterized by low capacity of their States to coordinate private interests within the meaning of the general interest.

Keywords: governance, national system of governance, Mediterranean Arab countries, formalization of the system of social regulation, coordination capacity of the state

1.Introduction

Our purpose in this article is to study the specificity of the culture of governance prevailing in the Mediterranean Arab countries. We adopt a critical approach which contests the notion of "Good Governance" of the World Bank, as supposed solution that corrects deficiencies in economic development models. We show that the "Good Governance" cannot be regarded as a-historical and universal necessity in any development strategy. Furthermore, according to Greif (1993, 1994, 1998), Meisel (2004, 2005), and Meseil and Ould Aoudia (2007), we retain the idea that institutions of governance can't be analyzed regardless of the culture in which they apply, and that institutional change should be approached as an endogenous process in the community, it is based on individual behavior (Note 1). We admit the existence of a multiplicity of cultures of governance and thus a multiplicity of national governance systems. Our work in this article is divided into two sections: in the first section, we define the concept of governance. We show that "Good Governance" cannot generate confidence in all economies regardless of their resources, their stories and their dynamic. Moreover, we adopt a broader concept of governance "Governance for Development" that takes into account the specific institutional arrangements prevailing in a country. In the second section, we use the "Institutional Profiles" database and we accomplish a multivariate descriptive study of different national systems of governance. The identification of such systems depends on how trust, power and information are produced, allocated and exchanged between different individuals. We show that the institutions of governance prevailing in the Mediterranean Arab countries are dominated by interpersonal and informal arrangements and by low capacity of states to coordinate interests within the meaning of general interest.

2. Governance and National System of Governance

2.1 Governance: Origin and Definition

In the early 1990s, the concept of governance is gaining in importance, to become part of the everyday vocabulary of the major international institutions. Despite the many applications of the term (Note 2), there is a common notion in its use. Indeed, it means "a movement of decentralization of decision-making with a proliferation of places and actors involved in this decision. It refers to the establishment of new forms of regulation more flexible, based on partnership between different actors" (The Free Encyclopedia, 2009). Governance involves several actors and is based on the principle that no actor has more power than another, including the State, which in this approach becomes an actor among others. In this regard, Roseneau (1992) points out that "dealing with

governance without government, that is to say a system of norms made by the agreement of the majority, which would thus achieving collective project without formal authority and concrete sanction governments". In addition, Rhodes (1996) defines governance as minimal State and a set of self-organized social networks. In this sense, governance can be seen as another name of the minimal State,"a process by which people resolves conflicts and achieve a cooperative solution" (Bsaies, 2006). The World Bank (2003) defines governance as "the exercise of authority in the name of the people", which means the need to involve citizens on an equal basis in the governance process (principle of inclusive) and that they are able to hold their government accountable for the way it makes use of State authority and resources of the people (principle of accountability). In addition, Kaufman and Kraay and Mastruzzi (2007) argue that governance refers to "the traditions and institutions by which authority is exercised for the overall property, including the process by which the authorities are selected, monitored and replaced, the capacity of government to effectively manage its resources and implement sound policies and the respect of citizens and the state for the institutions that govern economic and social interactions among them". For international financial institutions, the role of the State is to ensure the proper functioning of the market economy, that is to say to provide a favorable environment for private investment by reducing production costs, guaranteeing property rights, ensuring political stability and facilitating institutional arrangements. Good governance, where individual rights are respected, secure contracts, effective administration and democratic political institutions, is a universal solution to generate the confidence to begin the process of economic development. It is asked to transition and developing countries to adopt this tool for the development process begin. In their political of economic development cooperation, international donors will need to use their aid as an incentive to the reorganization or reorientation of policies and institutions in recipient countries. Good governance also appears as the guarantor of aid effectiveness for most donors, who believe that the failures of structural adjustment program in many developing countries are due to a deficiency of policy and institutional structures and to an inefficient public management, which is considered as a cause of wasteful of resources and a conversion of public institutions to a narrow circle of loyal and distribution of privileges and private benefits. This public governance is inefficient and it is necessary to substitute it by better governance (Good Governance). But more than a decade, after the forced invitation to them to comply was made, can we say that developing countries have adapted to good governance and the constraints arising from the globalization could undermine the system of governance which organized functioning of these countries and granted to their states a central decision-making power? In other words, is good governance a Good Development Strategy? More fundamentally, can we consider good governance as a-historical and universal necessity in any development strategy regardless of the specifics of the countries concerned?

2.2 Critique of the Concept of "Good Governance"

Meisel and Ould Aoudia (2007) show that, if good governance is certainly a powerful factor of confidence in developed countries, it can't produce confidence for all countries independently of their resources, their stories and their dynamics. The authors note a number of constraints faced by developing economies to build the institutions of good governance.

First, a mode of governance based on formal rules involves high fixed costs of investment in legal and judicial infrastructure and organization of monitoring and control. However, in most developing countries, the financial resources are often limited. Furthermore, these organizations must themselves be sufficiently ruled over a sufficiently long period to win the trust of investors. Given the financial, human and temporal constraints they face, the majority of developing countries do not afford this investment in the short or medium term. Then, the formalization of rules is long and complex. Institutional transition, the transition from an informal institutional status to a more formalized institutional state requires to go through phases of uncertainty where the old rules may no longer work, such as loyalty, respect for speech and traditional solidarity while the new rules based on the law and written agreements are not established in the heart of society. The erosion of the traditional system of social regulation leads to a loss of informal safety without any gain in the field of formal security (institutional). Countries cannot advance in this work and get stuck at the threshold of institutional transition.

In addition, the institutions of good governance have been strong resistance from the political and economic elites. In developing countries, most of the recommendations emphasize the importance of having governance institutions supporting the market. It is therefore formal rules where the mode of production of trust, power and information is systemic, conferring rights, including property rights, to all on written and enforceable bases. However, by its formal and universal character, this requirement is the germ of social destabilization and directly threatens the privileges of proponents of social order, the economic and political elites, which derive their power specially from their exclusive access to security of rights and resources. The resistance of interest groups is therefore presented as a blocking factor of institutions. In this regard, North et al. (2007) argue that the study of the

process of institutional change must be understood in terms of transition of the closed social orders towards opened social orders. The survival and sustainability of the dominant coalition depends on its ability to block access to these new social actors that they could jeopardize their privileges.

Finally, the institutions of good governance cannot explain the performance of some developing countries. Meisel and Ould Aoudia (2007) show that the economic boom experienced by these countries has no direct relationship with the "Good Governance". Countries that share the same level of "bad governance" may have completely opposing economic performance; some have experienced high growth assured them off and the other on the contrary remained trapped in systems of very low growth. The examples of China, Vietnam, Korea, Taiwan and Malaysia, on the one hand, and those of Zimbabwe, Madagascar, Côte d'Ivoire and Venezuela, on the other hand, are these points of view edifying (Note 3). Furthermore, the authors found no significant correlation between foreign direct investment in developing countries and each component of good governance. So that, contrary to the "common wisdom", "Good Governance" is not a major criterion for location decisions of international investors. Countries characterized by low performance in terms of governance receive higher investment flows, while countries with good performance in governance receive little FDI. In addition to traditional factors attracting FDI, the main factor in their attractiveness is the willingness of insiders, political and economic elites in recipient country, to allow or not the entry of newplayer in the market. Insiders oppose the entry of FDI, such as the disregard of property rights and other institutional interlocks, if they perceive the arrival of FDI as a threat to their rent position. By cons, facilities and advantages shall be granted if they have a personal or common interest following their entry.

Therefore, "Good Governance" proposed by the World Bank, cannot be an effective and universal solution for any development program, dice when we adopt a new and expanded concept of governance proposed by Meisel and Ould Aoudia (2007).

2.3 To a Broader Concept of Governance

Meiselet al. (2007) have proposed a new and broader governance "governance for development", which takes into account both concept: (i) different institutional arrangements (Note 4) that produce trust between agents, between agents and organizations (State, enterprises) through arrangements taking into account the level of development of each country (governance focal monopoly, formal rules) and (ii) the political economy of systems of social regulation (the opening of system insiders) (Note 5). Based on this broader concept of governance, we assume the existence of several production factors of trust, which vary depending on the level of income and the economic, political and social context of the considered economy. For each factor of production of trust corresponds a system (or similar systems) of governance.

This broader notion of governance "Governance for Development", presupposes that economic development is a multidimensional phenomenon where economic and political factors are interdependent in terms of their effects on society. The transition from poor to rich countries implies radical changes, deep ruptures, causing strong resistance whose outcome is uncertain. Economic policy analysis allows us to understand this type of behavior adopted by the ruling coalition. It designs the decisions and actions of the state as the resulting exchanges made on the "political market" involving different actors (voters, interest groups, politicians and bureaucrats).

Therefore, it is more convenient to expand our traditional view of national systems of governance rather than trying to understand the multitude of existing institutional profiles among developing countries through the single prism of criteria derived from Anglo-Saxon experience. It is possible for each developing country to build its own institutional development model. Governance systems should be understood in terms of their ability to produce "trust" and information (Note 6). Production factors of trust vary by income level and by economic, political and social context of the considered economy. At each trust production factor corresponds a system (or homologous systems) of governance.

2.4 National System of Governance

Meisel (2004, 2005) distinguishes different institutional systems whose identification depends on how trust, power and information are produced, allocated and exchanged between different individuals. The author suggests that the production of trust depends on:

(i) the degree of formalization of the rules governing the economic, political and social activities. We can then distinguish the systems of governance where the production of trust, power and information is systematic and is based on formal rules and others characterized instead by informal rules and an interpersonal mode of production of trust.

(ii) the ability of the government to change the structure of incentives and information in games of private interests

so that they also serve the interests of the national community. The existence of adequate instances of deliberation, consultation and coordination permit identification of the "common interest" and its realization. "The role of governance institutions is then to ensure that the field of social interactions is not reducible to a simple game of power relation between different individuals, but allows continually to a common interest to emerged and to be realized" (Meisel, 2005)

We can then distinguish governance systems characterized by a high degree of focus or coordination of private interests in order to achieve a collective interest and others instead characterized by a low degree of coordination and the existence of a multiplicity of focal governance. Four types of national systems of governance can be distinguished:

• Governance systems based on formal and impersonal rules. In such systems, the formalization of rules is an important tool for the production of trust between individuals. These rules apply to all and ignored the intrinsic characteristics of each individual, which ensures a high level of confidence in their respect and enforcement. This method of producing confidence characterizes developed countries that have experienced a long process of depersonalization of social relations and formalization of rules. Production of trust can be described by systemic.

• The governance systems based on personal relationships: In such systems, the trust in the relationship to power, in the flow of information and in the rules are made and shared according to the specific characteristics of individuals or their belonging to a group (family, ethnic) of limited size by definition. Such a system characterizes many developing countries in the years 1950-1960, which were early in their industrialization process. Nevertheless, as the population grew and the economy is opened and integrated with the regional and global economy, traditional production system of trust has become unsustainable. Using a system of depersonalization of social, economic and political regulations became inevitable. Indeed, local actors are engaged in commercial and financial transactions with foreign players, who are accustomed to systems based on formal rules, where high levels of trust and information produced by the system itself.

• The systems of governance based on the existence of a governance focal monopoly. These types of organization are based on the existence of a state that has the ability, with varying degrees, to coordinate, the relationships between interest groups prevailing at different levels of society, at international, national and local levels in order to exceed oligopolistic struggle between these groups for access to rents and achieve the highest possible common interest. The power of a governance focal monopoly depends on its ability to coordinate the interests and influence the private logic of special interest coalitions in the direction of the general interest in the long term, so that stakeholders are not only interested in what think or what is going to do the other (pure strategic rivalry), but they think about a stable and unique solution can be established. If the focal monopoly is powerful enough, it can ensure that the public interest is taken into account by each of the interest groups even in developing its strategy.

Hence it changes the structure of incentives and information in games of particular interests, so as a result that interest groups serve a much wider interest than their own. Therefore it acts directly on growth by reducing transaction costs and ensuring security expectations for agents.

Several historical experiences illustrate the operation of governance focal monopoly. South Korea has realized its economic takeoff during the period 1960–1990 with a strong coordinator and anticipatory State. The France of the "thirty glorious years" also had a highly coordinator-anticipatory State, allowing it to provide very high economic performance since the end of World War II until the early 1970s. Furthermore, the majority of the reforms in China have produced good results from1978 thanks to special attention paid by the government to the interests of different social actors involved in the reform processand, in particular, interest groups individuals.

• The governance systems based on crony capitalism.

This system corresponds to a situation where the political and economic elites are strongly linked. Such a system characterizes economies that are vulnerable to political instability phenomena due to conflicts between coalitions of special interests, so that the option of focal monopoly, of coordination and institutionalized dialogue seem to deviate. For these countries, a system based primarily on the "cronyism", offers a solution much cheaper and easier to implement. The solution is to involve government officials or their relatives to the income produced by the asset owners in the exploitation of resources. Political and administrative elites accordingly provide a "broadly inclusive" interest (encompassing) in the rents generated by the economy.

It should be noted that such a system of governance characterizes the majority of developing economies. It is a priori an inexpensive solution and seemingly beneficial to economic growth but it has serious limitations. In order to establish legitimacy of political leaders, such a system of governance can initiate or ensure the growth of some macroeconomic aggregates (such as increased investment or gross domestic product) but does not guarantee

economic development or sustainability of this growth over a long period. In this regard Ouel Aoudia (2006), Souissi (2013, 2014) show thata system of governance characterized by a strong collusion between economic and political elites is an obstacle to their economic takeoff and their convergence to advanced economies. Furthermore, Benali (2004), Diallman (2001), El Morched (2008), Catusse (2009), Gobe (2007) show that during the implementation of reforms, the political class in most developing countries day to prevent the risk of a strong opposition. Its main objective is the search for greater legitimacy ensuring their continued power. For this, it develops clientelistpoliciesand distributesprivilegesand benefits. More stakeholders and interest groups claim, the more they threaten the détenants of political power and the more they get privileges. In this sense, works are multiplied onthe formation ofcoalitionsbetweenpolitical and economic elitesand the emergenceof winners andlosersofadjustment policies.

3. The Specificities of National Systems of Governance in the Mediterranean Arab Countries: A Principal Components Analysis

The principal component analysis (PCA) is a statistical instrument that is used to extract the information in a database consisting of a set of individuals, characterized by a high number of variables roughly correlated.

It offers a representation of individuals on factorial designs with two dimensions (only representable). The axes are in fact built on the basis of linear combinations of variables and variance of all observations. They are classified according to the level of variance of the point cloud that it can focus. The first axis is the one that captures the most variance of the point cloud formed by the set of variables, then the second, etc. The interpretation of the first two axes is crucial in the factor analysis. It is done mainly on the basis of the identification of variables that contribute most to the definition of the axes in question. By this method we try to locate countries on a factorial design to identify governance systems characterized by all countries reviewed, in particular the Mediterranean Arab countries.

This work is inspired from Meisel (2004), whose theoretical assumptions have not yet been empirically verified. The author suggests the existence of a multiplicity of cultures of governance, every culture is characterized by the way that the trust, the power and information are produced, organized and shared.

We consider the two modes of production of confidence indicated above:

-The formalization of the system of social regulation and

-The governance focal monopoly.

Meisel and Oueld Aoudia (2007, p. 43) have proposed two sets of indicators that reflect these institutional aspects. Concerning the indicators of formalization of the system of social regulation, the variables are: (1) the effectiveness of the public administration, (2) control of corruption, (3) the security of formal property rights, (4) security transactions on the markets for goods and services and financial markets, (5) the security of rights and property transactions, (6) institutional solidarity, (7) the regulation of the financial system, (8) compliance labor law. Regarding the indicators of coordination and anticipation, we consider the following variables: (1) the ability of the state to facilitate forms of collaboration to emerge a common interest, (2) the capacity for autonomous decision of the State (3) the priorities of elite development, (4) coordination within and between governments, (5) the ability of political authorities, (6) the authorities' strategic vision, (7) the ability of the company for Innovation, (6) technological business environment, (8) investment in the future of the population, (8) technological environment, (9) venture capital.

Detailed or elementary questions that correspond to our indicators cited above are mentioned in Appendix A.

The availability of the database "Institutional Profiles" for the years 2001–2006 and 2009 gives us the opportunity to conduct a comparative study of the specificity of governance systems in the Mediterranean Arab Countries for the years 2001, 2006 and 2009. We have 55 countries for the year 2001, 85 countries in 2006 and 129 countries in 2009. We use disaggregated data (items) of each of the bases. We have 28 elementary variables for the year 2001, 40 elementary variables for 2006 and 52 elementary variables for the year 2009 (see Appendix A).

The application of the method of principal component analysis (Note 7) on each of the databases of 2001, 2006 and 2009 allows us to obtain results (outputs) respectively presented in Appendix B, C and D.

We discuss below the results of the year 2001. It is the same comment for the years 2006 and 2009:

-The test of sphericity of Barlett (Table1 below) shows a significant absence of spherical model. In fact, if the model is spherical, we can assume that the correlations between the variables areclose to zero and thusthere isno incentive to replace the variables with the components.The observed value must be less thanor equal to 0.05. In our case, the meaning is equal to 0.000, which means that the hypothesis H0 is rejected, that is to say that there's

a significant lack of sphericity and we can therefore continue to study the principal components of governance. In addition, the test Kaiser-Meyer-Olkin (KMO), which is a generalized measure of the partial correlation between the study variables, shows that the principal components factor analysis of governance systems is of high validity (with a measure equal to 0.899) (Note 8).

Table1. Index KMO and Barlett test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,899
	Approx. Chi-Square	1155,581
Bartlett's Test of Sphericity	Df	378
	Sig.	,000

Note. Survey 2001.

- Table B1 of Appendix B shows the most important components (or factors) according to their degree of inertia. There are so many factors as variables. Only those components with eigenvalues greater than 1 are selected (there are 6 components) (Note 9). In our factorial design, we retain the first two factors, those which concentrate the maximum amount of information contained in our database; it is 51.894% for the first factor and 7.642% for the second factor.

- Table B2 of Appendix B provides the matrix components after rotation (Note 10). There are coefficients of different variables with respect to each component. The variables that contribute to the formation of a factor are those that have the highest coefficients of this factor. In fact each variable can be presented by the following expression:

$$X_i = a_{i1}F_1 + a_{i2}F_2 + \ldots a_{in}F_N$$

With, a_{ij}= the coefficient of the variable i associated with factor j;

N= Number of factors.

The variable Xi will be captured by the factor whose coefficient is the highest. Moreover, it is noted that the sum of the square of the coefficientsa_{ij}, ie $\left(\sum_{i=1}^{n} a_{ij}^2 \right)$, gives the weight of the variable i or the part of the variance explained by the n factors. $\left(a_{ij}^2 \middle/ \sum_{i=1}^{n} a_{ij}^2 \right)$, represents the hand of the variance of the variable i sensed by the factor j. Factor j captures the variables having the highest information on this axis.

Given that the factor F_j may be presented by the following expression:

$$F_j = \sum_{i=1}^{p} w_{ji}X_i = w_{j1}X_1 + w_{j2}X_2 + \ldots w_{jp}X_p$$

With w_{ji}=the coefficient of the variable I associated with the factor j. p= the number of variables.

The weight of the factor j or the variance of the factor j is given by the sum of the square of the coefficients of the factor $\left(\sum_{i=1}^{p} w_{ji}^2 \right)$. Variance of factor j relative to the sum of the variance of the three factors gives the degree of inertia or the part of the variance of each factor; it is 51.894% for the first factor and 7.642% for the second factor.

We consider the Table 2 below, which takes account of variables in the database that have contributed to the formation of the first two axes. We distinguish two families of variables, those who have the highest correlation coefficients with respect to the axis 1 and those with the highest correlation coefficients with respect to axis2. We note that the variables A3020, A3021, A3041, A3043, A6010, A6011, A6012 and A6013 are among all variables in the database, those who have the most weight in the formation of axis 1 and variable A5110, A5150, B5000 and B5001 those who have the most weight in the formation of axis2.

Table 2. Description of the first two axes by the active variables of the PCA for 2001

Variables	Labels of variables	Component 1	Component2
A3020	Level of "petty" corruption (between citizens and the administration)	0.679	
A3021	Level of "large-scale" corruption (between the administration and firms)	0.415	
A3041	Importance of tax evasion in the formal sector	0.502	
A3043	Capacity of the tax administration to implement measures decided on	0.497	
A6010	Effectiveness of legal measures to defend property rights between private agents	0.633	
A6011	Compensation in the event of de jure or de facto expropriation (by the Government) of real property	0.804	
A6012	Compensation in the event of de jure or de facto expropriation (by the Government) of instruments of production?	0.778	
A6013	Generally speaking, does the government exert arbitrary pressure on private property (red tape, etc)?	0.745	
A5110	Society's aptitude for technological adaptation and innovation		0.683
A5150	Do parents invest a great deal in their children's education?		0.654
B5000	*Proportion of technical staff (engineers, technicians)* insmall and medium firms.		0.547
B5001	Proportion of technical staff (engineers, technicians) in large firms		0.531
Variance in%		51.894%	7.642%
Cumulative variance in%		51.894%	59.535%

Variables that have contributed to the formation of the first axis reflect:

- The corruption that is apprehended by the A3020 and A3021 indicators;

- The efficacy of public policy and in particular the efficacy of fiscal systems, captured by variables A3041 and A3043;

- Security of formal properties rights seized by the variables A6010, A6011, A6012 and A6013;

In addition, variables that have contributed to the formation of the second axis take into account:

- The ability of the society to adaptation and innovation, captured by the variable A 5110;

- The investment in the future of the people, apprehended by the variable A5150;

- The technological environment and the diffusion of technology, captured by the variables B5000 and B5001.

The family of indicators having contributed to the construction of the first factor defines the degree of personalization in the functioning of governance institutions and those who contributed to the construction of the second factor define the level of coordination and anticipation (Note 11).

The first factorial plane derived from the principal component analysis and applied to 55 countries of the survey of MINEFE of 2001, is shown in Figure 1 below. This plan isbuilt from thefirst twoaxesof dispersion of variables revealed (Note 12).

- **The first axis** (vertical) that captures the most information contained in our base (i.e., 51.894 % of the total information) opposed two types of governance culture, namely the degree of "personalization versus depersonalization" in the functioning of governance institutions. This axis then discriminates between countries according to their degree of formalization of institutions. To the north of this axis, there are situated countries having governance systems characterized by highly formalized rules ie written and enforceable rules. Also, they are endowed with systems that ensure a high compliance with these rules: an efficacious and transparent administration, a security of transactions and property rights. On the south of this axis, focus systems marked mainly by informal links trust where formal control mechanisms are limited or poorly respected. The United States today can be located relatively on the high (north) of this axis because of their high level of formal regulation.

- **The second axis** (horizontal) captures 7.642% of the total variance and reflects the degree of "anarchy versus hierarchy" in the interaction of interests in a given country. To the left (west) are systems characterized by a multiplicity or a proliferation of potentially conflicting focal points of governance. The probability that any form of common interest emerge is low and the field of interaction of interests is likely to become a pure power game. Moving to the right (East), there are more hierarchical systems, characterized by a focal point of governance or a governance focal monopoly.

Figure 1, outcome of our PCA, shows that all countries are divided into four groups according to the institutional characteristics of their governance systems. In the area North-east of Figure 1, are positioned countries characterized with a relatively high degree of institutional formalization, as well as having an ability to coordinate interests in the direction of the general interest. Countries like Canada, Britain, the United States, Germany and Ireland are positioned towards the top of the quadrant indicated. These countries are characterized by a culture of governance based essentially on the formalization of rules and ensure high levels of trust, power and information as part of their normal operation. Their production of trust is called "systemic". In the North-west area of Figure 1 are positioned countries characterized by relatively formalized governance institutions and having a plurality of focal points of governance, for example Morocco and Egypt. Both countries are located in the North-west quadrant of the area, so they stand out compared to other Arab countries in the Mediterranean by a system of social control relatively formalized. In quadrants South-east and South-west are positioned countries with cultures of governance based on interpersonal and informal relationships. There are essentially countries in transition and developing countries. In the south-western part are localized countries characterized by a multiplicity of focal points of governance. The absence of a single focal point generally reflects the weak role of the State in the coordination of special interests. Algeria and Syria are located in this area. In these economies, the scope of interaction of interests is likely to become a pure power game without any form of general interest manages to emerge. Tunisia is located in the Southeast area and stands out compared to other Mediterranean Arab countries by a certain ability of the state to coordinate the interests in favor of the public interest. The system of governance prevailing in Tunisia in 2001 is governed by a governance focal monopoly.

Figure 1. Diversity of national systems of governance in 2001

Source: authors from (Institutional Profiles) database of 2001.

The projection of different individuals from the 2006 and 2009 surveys on the first factorial plane from the PCA are represented respectively by Figures 2 and 3 below.

Figure 2. Diversity of national systems of governance in 2006

Source: authors from (Institutional Profiles) database of 2006.

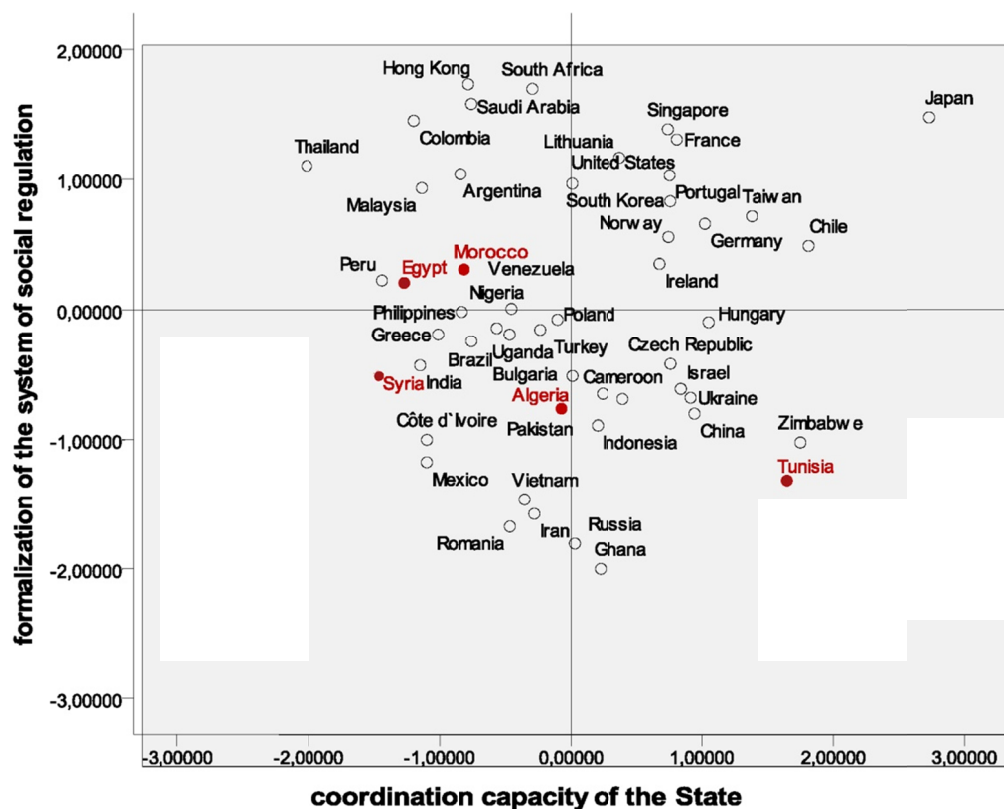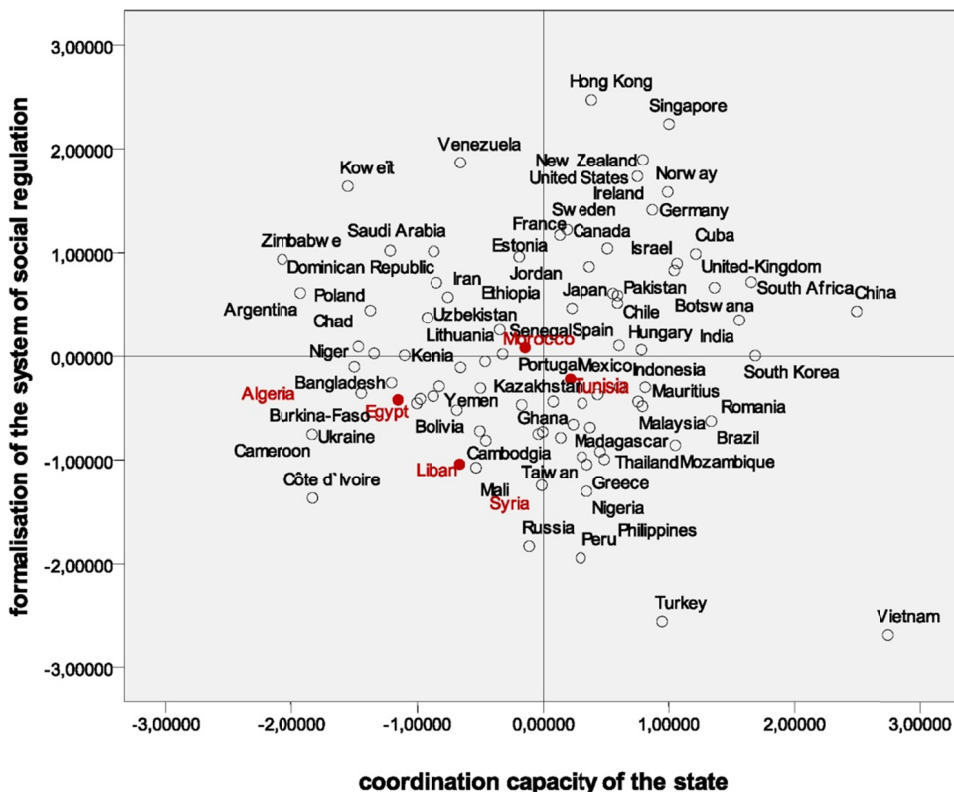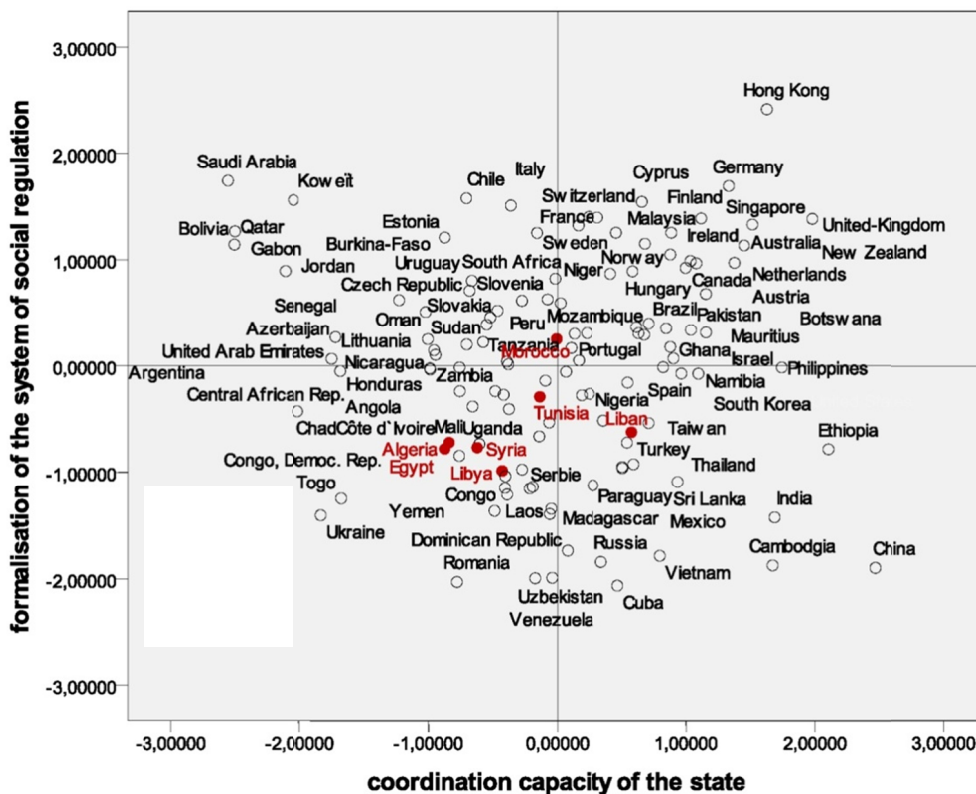
Figure 3. Diversity of national systems of governance in 2009

Source: authors from (Institutional Profiles) database of 2009.

As a result, if Figure 1 shows that in 2001 the Mediterranean Arab countries are characterized by a diversity of national systems of governance. Figures 2 and 3, which respectively describe the specificities of national systems of governance in 2006 and 2009, show that with the exception of Lebanon (who shows a transition to a governance focal monopoly in 2009), the Mediterranean Arab countries converge towards a system of informal social regulation and a multiplicity of focal points of governance. In fact, Egypt is experiencing a degradation of its production of confidence and moves to the Southwest quadrant area, its system of social regulation has become essentially based on personal relationships. Similarly, Tunisia, in 2006 still located in the area south-east of framing but towards the southwestern quadrant and approximates the center. In 2009, it is located in the Southwest quadrant of the chart. So the existence of a government with the ability to coordinate actors and secure expectations is no longer the case in Tunisia. In fact, more the country is facing west, more the option of focal monopoly seems to recede and more it is exposed to political instability phenomena due to conflicts between coalitions of special interests. Morocco is still located in the northwest area of the graph but it approaches to the center. Its production of trust, based on formal and impersonal rules in 2001, is weakened. Algeria and Syria (the Libya in 2009) maintain their positions on the charts, compared to 2001. Their Governance systems are fundamentally based on personal relationships and are characterized by low capacity of States to coordinate private interests and to develop a strategic vision for the development and sharing beyond insiders.

So the formalization of rules cannot be an important lever for producing confidence in the Mediterranean Arab countries. Similarly, the existence of a government with the capacity to coordinate actors and secure expectations cannot be the case for these economies. In this case a "crony system" appears to be much less expensive and easier to implement, in short more realistic option (Note 13).

In summary, the results of our principal component analysis showed that the Arab Mediterranean countries are characterized by:

1) Governance institutions bit institutionalized and dominated by interpersonal and informal arrangements (with the exception of Lebanon).

2) A multiplicity of special interest coalitions and low capacity of states to coordinate private interests within the meaning of general interest.

3) The capitalism cronyism or the interweaving of public and private interests is a priori an inexpensive solution and not necessarily antagonistic to economic growth. Such a situation allows establishing legitimacy of political leaders. This legitimacy is ensured by a certain ability to initiate the development of the country or the achievement of high rates of economic growth (e.g., Tunisia and Morocco) (Note 14).

However, the predominance of closed social orders, held by economic and political elites is the basis of resistance to institutional reforms and the transition to market economy and democracy.

4. Conclusion

The wealth of institutional data base of MINEFE has allowed us to identify different systems of governance in a set of developing countries, transition and developed. This is an illustration or a concretization of the concept of national systems of governance, developed by Meisel (2004). This database also allowed us to know the characteristics of the governance system prevailing in the Mediterranean Arab countries. The principal component analysis allowed us to identify the main discriminating factors, distinguishing countries by two dominant components: *(i)* the degree of formalization and depersonalization of governance systems on the one hand, and *(ii)* the degree of coordination of interests in favor of the public interest on the other hand. Location of different countries selected on the factorial design allowed us to identify different systems of governance. The Mediterranean Arab countries are among the countries that are still marked by the predominance of interpersonal arrangements and informal rules. They are marked by a low capacity for States to coordinate their individual interests or a multiplicity of focal points of governance. Except Lebanon, which converges to a governance focal monopoly in 2009, the other Mediterranean Arab Countries show a particularly strong governance deficit. We observe a quasi-absence of any mode of production of trust (formalized institutional system and governance focal monopoly). In these countries a "crony system" their appears a much less expensive and easier to implement, brief more realistic. However, the predominance of such a system is blocking the transition to market and democracy in the Mediterranean Arab countries. In this context, Nabli (2008) shows that the strong coalition between economic and political elites in Arab countries will block any institutional reform (progression of the rule of law) in these economies due to the resistance of the beneficiaries of the status quo and a self-sustaining imbrications of their public and private interests, on the one hand and a weak mobilization of the structure of social forces in these economies, on the other hand. Ben Abdelkader (2009) shows that the influence of the

dominant clan of the sources of power in the Mediterranean Arab countries is strengthened and paralyzes any form of collective action. El Morched (2008) shows that Morocco for example has in recent years deep political and institutional restructuring to make favorable conditions to the emergence of a market economy, to clean up the political and social environment and establish the rules of good governance. The first result of these reforms reveals some important achievements, such as the strengthening of human rights, the modernization of the judicial system, broadening the scope of freedom of expression, the attempt to moralize public life and the introduction of multiparty politics. However, the weak capacity of expertise of the reformers, the lack of constructive debate and asymmetric information have given rise to a rent-seeking behavior and a dynamic trading between various social groups rent-seeking (the bourgeoisie affiliated with the ruling political class, bureaucrats, political parties).

The consequence of such a situation of institutional blockage is the accumulation of tensions through the society that could cause an episode of violent and brutal destabilization. The requests to participate of social and community organizations, when not satisfied adequately, become the origin of many conflicts. Current social movements in the Arab economies demonstrate such a conclusion. Their goal is to develop robust, transparent and responsible governance institutions, based on respect for the rule of law.

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Notes

Note 1. "The formal system of governance reached by the developed countries is the result of a long and gradual process that began in Europe since the eighteenth century, leading to the affirmation of the free individual and the organization of society in democracy"Meisel (2005).

Note 2. In economics, in management, in political sciences, etc.

Note 3. In this regard, Meisel and OuldAoudia have used the (Institutional Profiles database and have identified key institutional factors that distinguish developing countries with high growth of those whose growth is slow. It is the ability of the State to offer actors credible forms of coordination, management of conflicting interests, driving population towards risk taking and achieving a common good higher than the sum of individual interests. In other words, it's the ability of the State to reduce uncertainty and to disseminate confidence to all agents. It is a focalization of private interests in favor of the public interest. This capability constitutes the priority element of governance, on which developing countries should focus their efforts to approach, in a first time, characteristics of developed countries. In a second step, the acquisition of confidence factors characterizing these latter, namely the highly formalized rules, can be favorably adopted and make sustainable growth in the long term. These modes of organizations are called (governance focal monopoly) and characterize some developing countries have experienced phases of strong acceleration and sustained growth (the countries of East Asia and South East in particular).

Note 4. The authors have adopted the definition of institutions of North (1990): institutions are constituted by a set of formal rules (constitution, laws and regulations, political system) and informal rules (value systems and beliefs, social norms) which regulate the behavior of individuals and organizations (companies, trade unions, NGOs).

Note 5. It is an opening of the system of economic regulation (widening of entry capacity on the market to new players), of social regulation (increased role of merit), and of political regulation (democracy).

Note 6. In fact, according to what has been mentioned above, the effectiveness of an institutional system depends on its ability to produce confidence.

Note 7. By using the software SPSS.

Note 8. Reading the KMO test is as follows:

- 0.90 and higher = very high validity;

- 0.89 to 0.80 = high validity;

-0.79 to 0.70 = average validity;

-0.69 to 0.60 = low validity;

-0.59 to 0.50 = validity threshold limit;

- 0.49 and less = invalid;

Note 9. In fact, most statistical software adopted for the selection of factors, the Kaiser criterion. This criterion retains factors whose explained variance (eigenvalue or inertia) is equal to or greater than 1. Components having a value less than 1 will be rejected. See on this subject G. FERGUSON (1971), Statistical Analysis in Psychologie, New York, McGraw Hill, pp. 421–425.

Note 10. In fact, by construction, factors are orthogonal (so they are uncorrelated). Methods for orthogonal rotation (varimax) preserve the condition of orthogonality of factors.

Note 11. Recall that, each of these two families of indicators belongs to a larger family of indicators describing an institutional aspect, defined by Aoudia Ould and Meisel (2007). These are the formalization of thesystemof social regulation and the coordination of private interests in favor of general interest.

Note 12. The application of the method of principal component analysis using the aggregated variables of data base offers the same results.

Note 13. However, it should be noted that the "cronyism" may appear in any culture of governance without becoming the dominant trait. In fact, a mode of production of formal and impersonal trust will be less exposed to the risk of spreading a culture of "cronyism" through the institutions of national governance.

Note 14. For other oil producing countries (such as Algeria or Syria) the establishment of a crony capitalism or partial redistribution of oil revenues (grants commodities in particular) provides some legitimacy to politicians without greater accountability from them (Ben Neffissa, 2002; Ben Abdelkader, 2009).

Appendix A

Overview of the Contents of Selected Institutional Variables

We present below the MINEFI issues that led to the elementary variables, from which we have built our governance indicators survey. We expose it according to its institutional themes.

Table A1. Formalization of the system of social regulation

A302	Corruption	1 = high level to 4=low level
A3020	Level of "petty" corruption	From 1 to 4
A3021	Level of "large-scale" corruption	From 1 to 4
A304	Effectiveness of public action: fiscal system	from 1 = large informal economy, generalized tax and customs evasion to 4 = small informal economy, little tax and customs evasion
A3040	weight of the informal economy	From 1 to 4
A3041	weight of tax evasion in the formal sector	from 1to 4
A3042	weight of customs evasion	from 1 to 4
A3043	Capacity of the fiscal administration to apply measures decided on	from 1= low capacity to 4= high capacity
A601	Security of property rights	from 1 to 4
A6010	Efficacy of legal means to protect property rights between private agents	from 1 = weak legal means to 4 = very effective legal means
A6011	Recompense in cases of expropriation by the State of law or de facto of real property (land)?	from 1 = no recompense to 4 = "reasonable" recompense
A6012	Recompense in cases of expropriation by the State of law or de facto of instruments of production?	from 1 = no recompense to 4 = "reasonable" recompense
A6013	In general, does the State exert arbitrarypressureon private property(red tape ...)?	from 1 = very prevalent arbitrary pressure to 4 = no arbitrary pressure
A904	Institutional solidarity	0 if no coverage by public or private institutions for sickness, unemployment, retirement - If coverage exists, grade from 1=small proportion of population covered to 4=very large proportion of population covered
A9040	Sickness coverage	from 0 to 4
A9041	Unemployment coverage	from 0 to 4
A9042	Retirement coverage	from 0 to 4

B607	Protection of rights and land transactions	from 1 or 0 to 4
B6070	Are agricultural land property rights mostly traditional (informal or quasi-informal) or are they formal?	from 1 to 4
B6071	Is the protection of TRADITIONAL property rights and transactions guaranteed?	from 0 to 4
B6072	Is the protection of FORMAL property rights and transactions guaranteed?	from 1 to 4
C701	Regulation of competition in the banking system	0 if no arrangements - if arrangements, grade from 1 = very low effectiveness to 4 = high effectiveness
C7010	Existence of arrangements to combat restrictive collective agreements	from 0 to 4
C7011	Existence of arrangements to combat abuse of dominant position	from 0 to 4
D601	Existence and observance of labour legislation and measures	0 if no laws or arrangements - if laws or arrangements exist, grade from 1=no observance to 4=observance
D6010	Minimum wage	from 0 to 4
D6011	Dismissal procedures	from 0 to 4

Table A2. Coordination-anticipation

A505	Consultation structures animated by the political power in order to find a common interest between actors	from 0 to 4
A5050	Does the political power anime consultation structures between the main actors?	from 0 to 4
A506	Government capacity for autonomous decision-making	from 1 to 4
A5060	Does the political authority have an autonomous decision-making capacity compared with the different stakeholders?	from 1 to 4
A508	Co-ordination between ministries and within the administrations	from 1 = weak co-ordination to 4 = strong co-ordination
A5080	Co-ordination between ministries	from 1 to 4
A5081	Co-ordination within the administrations	from 1to 4
A510	Capacity of the political powers	from 1=low levels of capability, to 4=high levels
A5100	Capacity of decision making of political powers in economic matters (competence, …)	from 1 to 4
A5101	Coherence and continuity of government action in economic matters	from 1 to 4
A5102	Authority of the political powers over the administration	from 1 to 4
A511	Ability of the society for innovation and adaptation.	from 1=to 4
A5110	Ability of the society for innovation and adaptation in technological matters	from 1 to 4
A5111	Ability of the society for innovation and adaptation in managerial matters	from 1 to 4
A5112	Ability of the society for adaptation and innovation in legal and institutional matters	from 1 to 4
A512	Long-term strategic vision of the government	from 1to 4
A5120	Does public power act in accordance with a strategic vision?	from 1 to 4
A514	The principal objectives of the local elites	from 1 to 4
A5140	Are economic growth and development a main concern for the political power	from 1 to 4
A5141	Are economic growth and development a main concern for the local public elites (government officials, universities, etc)?	from 1 to 4
A515	investment in the future of the population	from 1=low level of action to 4=high level of action
A5150	Do parents invest a great deal in their children's education?	from 1 to 4
A5151	Do parents steer their children more towards the civil service or the private sector?	from 1 to 4
B500	Technological environment, diffusion of technology	from 1 to 4
B5000	Technical supervisionrate(engineers, technicians) in SMEs/SMIs	from 1=low to 4=high

B5001	Technical supervision rate (engineers, technicians) in large companies	from 1=low to 4=high
B5002	concentration and "continuity" of business fabric (local subcontracting and maintenance, etc)	from 1=low concentration, continuity to 4=high
C500	Diffusion of technology, innovation	from 1 to 4
C5000	Level of competence of bank executives	from 1=low level of competence to 4=high level
C501	Innovation: venture capital	0 if no arrangements - if arrangements exist, score from 1=very weak to 4=very substantial
C5010	Financial arrangements encouraging venture capital	from 0 to 4

Appendix B

Table B1. total variance explained (année-2001)

Component	Initial eigenvalues		
	Total	% of Variance	Cumulative %
1	14.530	51.894	51.894
2	2.140	7.642	59.535
3	1.421	5.074	64.609
4	1.205	4.304	68.913
5	1.047	3.738	72.651
6	1.021	3.646	76.297
7	.845	3.019	79.315
8	.742	2.650	81.965
9	.610	2.177	84.142
10	.544	1.943	86.085
11	.484	1.728	87.813
12	.448	1.600	89.413
13	.418	1.494	90.907
14	.343	1.225	92.132
15	.303	1.081	93.212
16	.265	.946	94.158
17	.245	.874	95.033
18	.234	.835	95.868
19	.197	.703	96.571
20	.185	.661	97.232
21	.147	.524	97.755
22	.141	.505	98.260
23	.127	.453	98.713
24	.105	.376	99.089
25	.085	.303	99.392
26	.068	.244	99.636
27	.058	.206	99.842
28	.044	.158	100.000

Table B2. Rotated component matrix (survey2001)

	Component					
	1	2	3	4	5	6
A3020	.679	.457	.307	.285	.127	.138
A3021	.415	.324	.506	.367	.231	.220
A3040	.454	.434	.248	.469	.172	.307
A3041	.502	.443	.231	.488	.049	.125
A3042	.479	.602	.157	.468	.105	.179
A3043	.497	.437	.317	.349	.027	-.057
A6010	.633	.234	.273	.389	.258	.106

A6011	.804	.169	.092	.250	.274	.103
A6012	.778	.166	.234	.217	.284	.070
A6013	.745	.144	.426	-.007	-.045	.074
A9040	.167	.473	.099	.193	.710	.091
A9041	.021	.262	.077	.107	.801	.301
A9042	.326	.056	.280	.254	.721	.081
D6010	-.215	.458	.167	-.297	.282	.583
D6011	.282	.007	-.047	.159	.192	.808
A5100	.225	.145	.612	.490	.253	.079
A5101	.203	.041	.500	.594	.373	-.080
A5102	.199	.093	.121	.869	.154	.105
A5110	.099	.683	.216	.177	.263	.194
A5111	.271	.212	.792	.150	.085	.047
A5112	.263	.250	.761	.183	.263	-.075
A5120	.166	.347	.352	.623	.167	-.066
A5150	.320	.654	.082	.140	.195	-.133
B5000	.351	.547	.391	.063	.323	.094
B5001	.334	.531	.311	.129	.374	.232
B5002	.480	.404	.190	.021	.450	.056
C5000	.489	.135	.523	.281	-.018	.360
C5010	.485	.225	.384	.277	.435	-.121

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Appendix C

Table C1. KMO and Barlett'stest (survey 2006)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.885
Bartlett's Test of Sphericity	Approx. Chi-Square	2883.449
	Df	780
	Sig.	.000

Table C2. Total variance explained (survey 2006)

Component	Initial eigenvalues		
	Total	% of Variance	Cumulative %
1	17.949	44.872	44.872
2	2.346	5.865	50.737
3	2.175	5.438	56.175
4	1.710	4.276	60.451
5	1.594	3.986	64.438
6	1.380	3.449	67.886
7	1.244	3.110	70.997
8	1.068	2.669	73.666
9	.931	2.328	75.994
10	.832	2.079	78.073
11	.778	1.945	80.019
12	.690	1.724	81.742
13	.637	1.592	83.334
14	.599	1.497	84.832
15	.563	1.406	86.238
16	.540	1.350	87.588
17	.477	1.193	88.780
18	.423	1.058	89.838
19	.394	.985	90.823
20	.365	.914	91.737

21	.329	.823	92.559
22	.318	.794	93.353
23	.302	.756	94.109
24	.282	.704	94.813
25	.265	.662	95.475
26	.240	.599	96.074
27	.216	.540	96.614
28	.196	.491	97.105
29	.185	.464	97.568
30	.168	.420	97.989
31	.151	.378	98.366
32	.122	.305	98.671
33	.114	.284	98.956
34	.099	.248	99.203
35	.080	.201	99.405
36	.070	.175	99.579
37	.066	.165	99.744
38	.050	.125	99.869
39	.033	.083	99.952
40	.019	.048	100.000

Table C3. Rotated component matrix (survey 2006)

| | Component | | | | | | | |
	1	2	3	4	5	6	7	8
A5050	.334	.719	.116	.110	-.019	.160	-.071	-.051
A5060	.356	.289	-.220	.069	.306	-.007	.383	-.546
A5080	.617	.546	.066	.201	.086	.038	.001	.230
A5081	.583	.415	.104	.341	.266	.043	.044	.142
A5100	.304	.606	.428	.291	.106	.121	.144	.092
A5101	.245	.636	.281	.247	.161	.172	.135	-.054
A5102	.659	.170	.091	.294	-.008	.098	.126	-.013
A5110	.246	.376	.014	.572	.163	.162	.146	.285
A5111	.414	.299	.233	.425	-.002	.363	.077	.267
A5112	.438	.337	.235	.362	.111	.238	-.126	.114
A5120	.242	.830	.097	.051	.027	.005	.108	.082
A5140	.030	.726	.375	.229	.191	.016	-.046	.109
A5141	.279	.594	.171	.436	.085	.118	-.088	.060
A5150	.017	.297	-.017	.592	-.201	.116	.246	-.030
A5151	.169	.209	-.024	.120	.109	.116	.212	.752
B5000	.363	.055	.228	.641	.241	.232	.112	-.002
B5001	.250	.092	.177	.662	.236	.214	-.268	.048
B5002	.208	.351	.202	.647	.191	.072	.055	.083
C5000	.352	.044	.472	.014	-.058	.511	.158	.211
C5010	.206	.444	.351	.295	.010	.357	-.194	.001
A3020	.551	.305	.535	.046	.284	.210	.067	.094
A3021	.580	.383	.435	.076	.245	.102	-.028	.050
A3040	.637	.159	.442	.182	.142	.140	.109	.245
A3041	.723	.216	.249	.016	.187	.167	-.101	-.083
A3042	.692	.265	.308	.104	.183	.285	.124	-.011
A3043	.745	.142	.220	.344	.056	.120	-.056	-.026
A6010	.446	.273	.553	.179	.081	.148	.099	.134
A6011	.158	.136	.850	.119	.070	.233	.143	-.039
A6012	.200	.257	.843	.119	.070	.197	.090	-.040
A6013	.339	.180	.727	.179	.192	-.111	-.102	.078
A9040	.271	.351	.491	.337	.496	.046	.166	.075

A9041	.341	.212	.230	.288	.593	.240	.081	-.007
A9042	.181	.033	.420	.580	.412	-.012	.239	-.084
B6070	.196	.347	.247	.358	.354	.100	.470	.120
B6071	.011	.040	-.138	-.069	-.024	-.051	-.778	-.097
B6072	.152	.381	.520	.406	.239	.179	-.021	-.003
C7010	.226	.160	.187	.235	.261	.809	.017	.086
C7011	.187	.136	.151	.243	.287	.837	.046	.024
D6010	.081	-.018	-.067	.123	.732	.379	.194	-.040
D6011	.111	.105	.255	.060	.808	.054	-.133	.077

Appendix D

Table D1. KMO and Barlett's test (survey 2009)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.926
Bartlett's Test of Sphericity	Approx. Chi-Square	6538.508
	Df	1326
	Sig.	.000

Table D2. Total Variance explained (survey 2009)

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	25.730	49.480	49.480
2	4.143	7.967	57.447
3	2.505	4.818	62.265
4	1.741	3.349	65.613
5	1.638	3.149	68.762
6	1.191	2.290	71.053
7	1.039	1.997	73.050
8	.939	1.806	74.856
9	.894	1.719	76.575
10	.824	1.586	78.161
11	.745	1.433	79.593
12	.737	1.418	81.011
13	.666	1.281	82.292
14	.622	1.196	83.487
15	.592	1.138	84.625
16	.544	1.046	85.671
17	.514	.988	86.659
18	.503	.968	87.627
19	.462	.889	88.515
20	.427	.820	89.336
21	.411	.790	90.126
22	.355	.683	90.809
23	.342	.658	91.467
24	.337	.648	92.115
25	.309	.594	92.709
26	.286	.550	93.259
27	.284	.546	93.805
28	.258	.497	94.301
29	.243	.467	94.768
30	.236	.453	95.221
31	.221	.425	95.646
32	.196	.376	96.022
33	.187	.360	96.382

34	.180	.347	96.728
35	.165	.318	97.046
36	.162	.312	97.358
37	.156	.301	97.659
38	.142	.273	97.932
39	.139	.268	98.200
40	.119	.229	98.429
41	.112	.215	98.644
42	.106	.204	98.848
43	.095	.183	99.032
44	.085	.163	99.195
45	.074	.142	99.337
46	.072	.139	99.476
47	.069	.132	99.608
48	.061	.116	99.724
49	.056	.107	99.832
50	.042	.080	99.912
51	.033	.064	99.976
52	.012	024	100.000

Table D3. Rotated component matrix (survey 2009)

| | Component | | | | | | |
	1	2	3	4	5	6	7
A3020	.677	.279	.341	.155	.306	.016	.185
A3021	.635	.324	.300	-.077	.275	-.015	.225
A3022	.638	.347	.236	-.028	.379	-.080	.068
A3023	.574	.216	.475	.211	.292	-.067	-.029
B6090	.508	.260	.229	.515	.101	.049	.184
B6091	.494	.292	.203	.512	.124	.005	.247
B6092	.651	.033	.266	.323	.028	.072	.181
B6093	.560	.057	-.027	.297	.197	.058	.019
D6001	.101	.097	.176	.710	.061	-.130	.071
D6002	.526	.126	.216	.411	.023	-.050	.210
A9060	.396	.143	.528	.446	.211	.096	.273
A9061	.322	.106	.454	.455	.328	-.030	.321
A9062	.405	.060	.419	.537	.251	.122	.292
C7010	.362	.383	-.020	.564	.379	-.033	.132
C7011	.361	.400	-.010	.556	.383	.001	.105
A6000	.661	.370	.146	.254	.126	.068	.309
A6001	.617	.071	.143	.184	.541	.070	.127
A6002	.610	.143	.157	.264	.548	.064	.095
A6003	.603	.230	.190	.145	.349	-.022	.379
A6010	.697	.286	.177	.169	.291	.052	.166
A6011	.708	.135	.154	.259	.051	.103	.258
A6012	.723	.267	.077	.127	.033	.050	.156
A5000	.187	.787	.362	.088	.175	-.003	.102
A5001	.125	.804	.242	.152	.007	-.024	.061
A5002	.316	.757	.262	.228	.118	-.091	.049
A5010	.461	.499	.423	.041	.225	.158	.118
A5011	.411	.400	.553	.174	.120	.077	.098
A5020	.296	.446	.596	.018	.199	.218	.010
A5021	.549	.356	.543	.019	-.009	.163	-.077
A5022	.370	.461	.506	.107	.050	.166	.141
A5030	.405	.392	.564	-.021	.242	.165	.124
A5031	.519	.244	.411	.358	.224	-.102	-.072

A5032	.370	.275	.495	.319	.146	.090	-.022
A5033	.431	.385	.404	.095	.398	.180	.233
A5040	.249	.412	.403	.241	.507	.149	.082
A5041	.279	.458	.384	.198	.428	.084	.015
A5042	.252	.631	.154	.234	.295	-.018	.355
A5050	.013	.178	.804	.155	.118	.065	.169
A5051	.061	.177	.736	.210	.026	.265	.229
A5080	.223	.491	.248	.335	.467	-.002	.145
A5081	.468	.441	.096	.363	.271	-.015	.292
A5082	.361	.435	.258	.417	.264	-.059	.285
B5000	.328	.274	.237	.427	.352	-.067	.338
B5001	.310	.189	.252	.312	.538	-.010	.294
B5002	.279	.433	.279	.206	.508	.012	.326
C5000	.439	.199	.098	.168	.144	-.007	.724
C5001	.228	.103	.246	.204	.118	.078	.761
C5010	.312	.436	-.011	.237	.371	.084	.384
C5020	.078	.036	.093	-.005	.044	.945	.068
C5021	.045	.041	.100	.007	.075	.944	.079
C5022	.000	-.007	.100	-.080	-.035	.927	-.005
C5023	.030	-.047	.127	-.031	-.005	.902	-.070

Note. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 14 iterations.

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The Dynamic Relationship between Managerial Ownership and Corporate Diversification: Evidence for Family and Non-Family Businesses

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Abstract

In Taiwan, ownership structure is separated to differentiate between family businesses and non-family businesses. Moreover, the dynamic relationship between managerial ownership and corporate diversification is complicated. This study is attempted to examine, under different ownership structure, whether managerial ownership is associated with subsequent changes in diversification or diversification is associated with subsequent changes in ownership. This study used a sample of firms listed in Taiwan from 2002 to 2011; the Panel Data Regression with fixed effects model is utilized to find the relationship between managerial ownership and diversification. This result shows that in non-family businesses, managerial ownership (diversification) is negatively related to subsequent diversification (subsequent managerial ownership); in family businesses, managerial ownership (diversification) is positively related to subsequent diversification (subsequent managerial ownership). Therefore, investors should understand the business strategy that lead to changes among family business, managerial ownership and diversification in order to facilitate investment decisions.

Keywords: managerial ownership, corporate diversification, family businesses, dynamic relationship

1. Introduction

Empirical studies in the past supported a negative relationship between managerial ownership and corporate diversification (Denis, Denis, & Sarin, 1997; Denis, Denis, & Yost, 2002; Martin, & Sayrak, 2003; David et al., 2010). This is because, as managerial ownership increases, the consistency between owners and managers of the incentives will also increase, meaning that those managers will not adopt a corporate diversification strategy to decrease the value of the company. Unfortunately, these empirical results are validated based on cross-sectional data, from which it can be concluded that changes of managerial ownership will take place before the behavior of diversification. However, such cross-sectional data validation can not capture the changes in the relationship among the variables that occur over time. Goranova et al. (2007) found that managerial ownership for a period did not result in subsequent changes of diversification and therefore questioned the hypothesis of the interest alignment. The higher the level of diversification, the more positive the relationship with the subsequent changes of managerial ownership, supporting the view of reducing risk by managers. Nevertheless, their conclusions are based on a sample taken from developed countries and the hypothesis agency theory. Indeed, past studies have shown that the traditional agency problem is not serious in developing countries (emerging markets) as in developed countries (Tsai et al., 2006; Delios, Zhou, & Xu, 2008; Charoenwong, Ding, & Jiraporn, 2011). Therefore, whether the negative relationship between managerial ownership and diversification based on developed countries can be applied to developing countries, is a question and need to be verified.

Different ownership structures (family business and non-family business) will affect a company's supervision, strategy and performance (Shleifer & Vishny, 1994; Anderson & Reeb, 2003b). The family business structure is common in Taiwan; informal effect from family system exceeds the formal influence of the corporate system

(Liu, Lin, & Cheng, 2011). In addition, the management style of the family business is family members at the core, making it difficult for non-family managers to promote (Claessens, Djankov, & Lang, 2000). This phenomenon reflects that family business is difficult to attract good employees, limiting the talent pool, and ultimately blocking the company's growth. As a result, whether the causality between managerial ownership and diversification can be applied to family business in developing countries is also an interesting issue.

The study is attempted to re-examine the dynamic causal relationship between managerial ownership and diversification in Taiwan different ownership companies (family business and non-family business). The purposes of this paper are investigated (1) the relationship between managerial ownership and subsequent changes in corporate diversification under different ownership structures, and (2) the relationship between diversification and subsequent changes in managerial ownership under different ownership structures. As our knowledge, this is the first study to apply dynamic relationship between managerial ownership and diversification in family business in emerging markets. In addition, the findings should also be useful to investors in developed countries who might be planning to enter the Taiwanese and Chinese finance markets (Note 1).

2. Literature Review

Incentives alignment from managerial motivation can be effectively increased the company wealth to avoid diversification (Beatty & Zajac, 1994; Jensen & Meckling, 1976; Martin & Sayrak, 2003). Therefore, most previous studies indicated that there is a negative relationship between ownership structure and company diversification (Amihud & Lev, 1981; Berger & Ofek, 1995). However, it is difficult to understand the causal relationship among variables because this type of verification can not capture changes in corporate behavior over time (Li, Lam, & Moy, 2005). In addition, the management member and style are different between the family business and non-family business. If changes in the managerial ownership structure are examined using longitudinal data and the different ownership, we could understand that how changes of the managerial ownership structure affect the dynamic of diversification behavior in family and nonfamily business.

2.1 Longitudinal Effects of Managerial Ownership on Diversification

2.1.1 Non-Family Businesses

Ddiversification in non-family businesses is an indication of managers pursuing their own interests and risk diversification, but the major shareholders can adopt concentration of ownership to resolve this agency problem (Johnson, 1996; Boyd, Gove, & Hitt, 2005; Chen & Hsu, 2009). Bethel and Liebeskind (1993) found that within a period of time there was a negative correlation between the ownership of major shareholders and later diversification. This implies that the monitoring from major shareholders will affect the later level of diversification. Denis, Denis and Sarin (1997) also pointed out that increased managerial ownership would reduce the level of diversification, showing that the monitoring from managerial ownership could reduce later diversification behavior. Also, when managerial ownership is increased, the agency problem of free cash flow will be reduced, as well as the interest alignment will be strengthened (Amihud & Lev, 1981). Therefore, we expect the following hypothesis:

H 1-1: In non-family businesses, managerial ownership is negatively related to subsequent changes in corporate diversification.

2.1.2 Family Businesses

Due to managers and owners in family business are the same (most managers are members of family), the traditional agency theory (Type I) could not apply to family business (Anderson & Reeb, 2003a; Chrisman, Chua, & Sharma, 2005; Tsai et al., 2006). However, when the ratio of equity held by family shareholders is large enough for effective control of the company, type II agency problems between controlling and minority shareholders occur. Family shareholders are concerned with the family's interest, rather than those of minority shareholder (Chu, 2009). In order to maximize its own benefits, the family business may take over other shareholders interests exercising controlling power and expropriate the wealth of minority shareholders. In the diversification aspect, it results in good opportunities for speculation and exploitation of the interests of minority shareholders (Claessens, Djankov, & Lang, 2000; Claessens et al., 2002). Therefore, enlargement of the manager's ownership in the family business will enhance later diversification to exploit the interests of minority shareholders. The hypothesis is as follows:

H 1-2: In family businesses, managerial ownership is positively related to subsequent changes in corporate diversification.

2.2 Impact of Diversification on Managerial Ownership

2.2.1 Non-Family Businesses

Managers in non-family business take a tendency to their own benefits and pursue a higher operational risk than the shareholders. From the behavioral agency viewpoint, if the strategy of diversification is aimed at reducing risk, managers should have a positive response and willingness to subsequently increase the level of ownership (Wiseman & Gomez-Mejia, 1998). They will have more ownership to reflect the willing to take higher risk to get their own interests (Eisenhardt, 1989; Sanders & Carpenter, 2003). However, managerial motivation to purse value decreasing activities can be effectively reduced by means of incentives alignment (managerial ownership) to engage in the activities which increase the company wealth (Beatty & Zajac, 1994; Jensen & Meckling, 1976). Therefore, company diversification and subsequently enhanced managerial ownership would be a negative relation. We expect the following hypothesis:

H 2-1: In non-family businesses, diversification is negatively related to subsequent changes in managerial ownership.

2.2.2 Family Businesses

Zahra (2005) showed that managers with family members are more highly motivated to follow a strategy of risk aversion. Furthermore, family business will avoid diversification, because the company is viewed as family member or descendant assets (Casson, 1999; Anderson & Reeb, 2003b). Schulze, Lubatkin and Dino (2002) have pointed out that the concentration of family businesses ownership may reduce the entrepreneurial spirit, in turn to induce conservative strategies. Therefore, family business managers are more conservative than non-family business management, in relation to diversification strategies. However, family shareholders have greater a motivation and ability to expropriate the wealth of minority shareholders (La Porta et al., 1999). This is the Type II agency problem where controlling shareholders exploit minority shareholders (Shleifer & Vishny, 1997; Ellul, Guntay, & Lel, 2007). That is, in family businesses, it is easy to take advantage of their controlling power to make self-benefiting decisions, causing minority shareholders to suffer loss of wealth. Even diversification is a strategy for reducing corporate value, for the family maximum benefits' purpose, family business managers may enlarge the level of diversification for the expropriation (Amihud & Lev, 1981; Berger & Ofek, 1995; Hoskisson, Hill, & Kim, 1993; Lang & Stulz, 1994). After that, minority shareholders will enforce to sell their stock; family business managers will increase their ownership to enhance control rights of family business. Therefore, when managers of family businesses enlarge the diversification strategy, they will increase their subsequent ownership in order to protect family control right and wealth. Therefore, this study suggests that after diversification, the managerial ownership will be increased. The hypothesis is as follows:

H 2-2: In family businesses, diversification is positively related to subsequent changes in managerial ownership.

3. Research Methodology

3.1 Sample and Model

The sample in this study is taken from companies listed in Taiwan from 2002 to 2011. The financial and corporate governance information is acquired from the Taiwan Economic Journal (TEJ) database, annual reports and the prospectuses of listed Taiwan companies. The product and industry classification used for computing the indicators of diversification is obtained from the "Industry and Economic" classification structure developed by the Taiwan Institute of Economic Research (TIER) database. This sample is excluded financial industry, insurance industry and banking industry, because of avoiding confounding effect. The sample included around 364 firms list in Taiwan stock market (TSE) during the period of 2002 to 2011, totally 3,642 observations after excluded financial institution data and missing data. In this study, there are a total of 3,642 observations, of which 2,169 (59.55%) of the observed values are for family firms and 1,473 (40.45%) of the observed values are non-family firms. In addition, the sample in this study includes both cross-sectional data and time series data. This study adopts panel data analysis (Note 2).

The dynamic relationship between managerial ownership and diversification is modeled and verified. Models 1, 2, 3 and 4 verify hypotheses 1-1 and 1-2, respectively, representing the dynamic relationship of managerial ownership over a period of time and the subsequent company diversification between family businesses and non-family businesses, formulated as follow:

Partial sample–family business

$$DIV_{i,t}=\alpha_0+\alpha_1 FBOWN_{i,t}+\alpha_2 LogSIZE_{i,t}+\alpha_3 RISK_{i,t}+\alpha_4 DEBT_{i,t}+\alpha_5 IND_{i,t}+\alpha_6 ROA_{i,t}+\alpha_7 DUAL_{i,t}$$
$$+\alpha_8 OUTDIR_{i,t}+\alpha_9 DIROWN_{i,t}+\alpha_{10} BLOCK_{i,t}+\alpha_{11} INST_{i,t}+\varepsilon_{i,t} \qquad (1)$$

$$DIV_{i,t+1}=b_0+b_1 FBOWN_{i,t}+b_2 LogSIZE_{i,t}+b_3 RISK_{i,t}+b_4 DEBT_{i,t}+b_5 IND_{i,t}+b_6 ROA_{i,t}+b_7 DUAL_{i,t}$$
$$+b_8 OUTDIR_{i,t}+b_9 DIROWN_{i,t}+b_{10} BLOCK_{i,t}+b_{11} INST_{i,t}+v_{i,t} \qquad (2)$$

Partial sample–nonfamily business

$$DIV_{i,t}=\alpha_0+\alpha_1 NFBOWN_{i,t}+\alpha_2 LogSIZE_{i,t}+\alpha_3 RISK_{i,t}+\alpha_4 DEBT_{i,t}+\alpha_5 IND_{i,t}+\alpha_6 ROA_{i,t}+\alpha_7 DUAL_{i,t}$$
$$+\alpha_8 OUTDIR_{i,t}+\alpha_9 DIROWN_{i,t}+\alpha_{10} BLOCK_{i,t}+\alpha_{11} INST_{i,t}+\varepsilon_{i,t} \qquad (3)$$

$$DIV_{i,t+1}=b_0+b_1 NFBOWN_{i,t}+b_2 LogSIZE_{i,t}+b_3 RISK_{i,t}+b_4 DEBT_{i,t}+b_5 IND_{i,t}+b_6 ROA_{i,t}+b_7 DUAL_{i,t}$$
$$+b_8 OUTDIR_{i,t}+b_9 DIROWN_{i,t}+b_{10} BLOCK_{i,t}+b_{11} INST_{i,t}+v_{i,t} \qquad (4)$$

The dynamic relationship between managerial ownership and diversification is modeled and verified. Models 1, 2, 3 and 4 verify hypotheses 1-1 and 1-2, respectively, representing the dynamic relationship of managerial ownership over a period of time and the subsequent company diversification where $DIV_{i,t}$ is company i's level of diversification in the tth period; $DIV_{i,t+1}$ is company i's level of diversification in the t+1th period; $NFBOWN_{i,t}$ is the executive ownership in a non-family business in the tth period; $FBOWN_{i,t}$ is the executive ownership in a family business in the tth period; $LogSIZE_{i,t}$ is the size of company i in the tth period; $RISK_{i,t}$ is the risk of company i in the tth period; $DEBT_{i,t}$ is the financial leverage of company i in the tth period; $ROA_{i,t}$ is the performance of company i in the tth period; $DUAL_{i,t}$ is the status of company i's CEO duality in the tth period; $OUTDIR_{i,t}$ is the ratio of company i's outside board directors in the tth period; $DIROWN_{i,t}$ is the shares held by company i's board directors in the tth period; $BLOCK_{i,t}$ is the ratio of share numbers of company i's major shareholders in the tth period; $INST_{i,t}$ is the ownership of company i's institutional investors in the tth period; $IND_{i,t}$ is the industry category of company i in the tth period; $\varepsilon_{i,t}$ and $v_{i,t}$ are model residuals, while $\varepsilon_{i,t}$; $v_{i,t} \sim N(0,1)$.

Models 5 to 8 are used to verify hypotheses 2-1 and 2-2, which represent the relationship of the level of diversification over a period of time and the subsequent managerial ownership between family businesses and non-family businesses. The variables are the same as those defined above.

Partial sample–family business

$$FBOWN_{i,t}=c_0+\alpha_1 DIV_{i,t}+c_2 LogSIZE_{i,t}+c_3 RISK_{i,t}+\alpha_4 DEBT_{i,t}+c_5 IND_{i,t}+c_6 ROA_{i,t}+c_7 DUAL_{i,t}$$
$$+c_8 OUTDIR_{i,t}+c_9 DIROWN_{i,t}+c_{10} BLOCK_{i,t}+c_{11} INST_{i,t}+\varepsilon_{i,t} \qquad (5)$$

$$FBOWN_{i,t+1}=d_0+b_1 DIV_{i,t}+d_2 LogSIZE_{i,t}+d_3 RISK_{i,t}+d_4 DEBT_{i,t}+d_5 IND_{i,t}+d_6 ROA_{i,t}+d_7 DUAL_{i,t}$$
$$+d_8 OUTDIR_{i,t}+d_9 DIROWN_{i,t}+d_{10} BLOCK_{i,t}+d_{11} INST_{i,t}+v_{i,t} \qquad (6)$$

Partial sample–nonfamily business

$$NFBOWN_{i,t}=c_0+\alpha_1 DIV_{i,t}+c_2 LogSIZE_{i,t}+c_3 RISK_{i,t}+c_4 DEBT_{i,t}+c_5 IND_{i,t}+c_6 ROA_{i,t}+c_7 DUAL_{i,t}+$$
$$c_8 OUTDIR_{i,t}+c_9 DIROWN_{i,t}+c_{10} BLOCK_{i,t}+c_{11} INST_{i,t}+\varepsilon_{i,t} \qquad (7)$$

$$NFBOWN_{i,t+1}=d_0+d_1 DIV_{i,t}+d_2 LogSIZE_{i,t}+d_3 RISK_{i,t}+d_4 DEBT_{i,t}+d_5 IND_{i,t}+d_6 ROA_{i,t}+d_7 DUAL_{i,t}$$
$$+d_8 OUTDIR_{i,t}+d_9 DIROWN_{i,t}+d_{10} BLOCK_{i,t}+d_{11} INST_{i,t}+v_{i,t} \qquad (8)$$

Where $NFBOWN_{i,t+1}$ is the executive ownership in a non-family business i in the t+1th period. $FBOWN_{i,t+1}$ is the executive's ownership in a family business i in the tth period. $\varepsilon_{i,t}$ and $v_{i,t}$ are model residuals, while $\varepsilon_{i,t}$; $v_{i,t} \sim N(0,1)$.

3.2 Dependent and Independent Variables

Level of diversification (DIV) is referred that Palepu (1985) used for calculation of entropy diversification is utilized, and Yang (2008) adopted for calculation of on diversification is used as a template to calculate the level of company diversification.

Due to fact that managers may consider there to be different risk conditions related and unrelated to diversification (Boyd, Gove, & Hitt, 2005), overall diversification (DT) is divided into two categories: related diversification (DR) and unrelated diversification (DU) (DT=DR+DU). Moreover, Palepu (1985) was defined as the level of diversification in the own products of industry w. The formula is DR= $\sum_{i-1}^{j} P_i^w \ln(1/P_i^w)$. Where j stands for the number of products in an industry w, P_i^w is the ratio of sales value for product i in industry w. (DU) is defined as the extent of company products across different industries (w = 1, ... z); the measurement is the average weight of all industries' ratio of sales and can be formulated follows: DU= $\sum_{w-1}^{z} P^w \ln(1/P^w)$.

Therefore, level of diversification (DIV) is used overall diversification (DT) to be a proxy.

In addition, Managerial ownership is OWN. Moreover, the ownership of family managers and the ownership of non-family managers are indicated by FBOWN, and NFBOWN.

Moreover, managerial ownership is measured by the number of outstanding shares held by managers and the ratio of shares held by managers to total shares. It has been found in previous studies that the value of the company is positively correlated with size and diversification (Denis, Denis, & Sarin, 1997; Grant, Jammine, & Thomas, 1998). Thus, if other conditions remain unchanged, the value of one percent of shares is likely to be higher for a diversified company is likely to be higher for a focused company. The percentage of equity which is claimed by signal theory; the reliability of the signal is correlated with the cost of the signal (Spence, 1973). Family business judgments are the number of seats on the board directors occupied by the family members are used as the criteria for judging who has "ultimate control", which made based on the definition of La Porta et al. (1999) and Yeh, Lee and Woidtke (2001). Family business is indicated by the dummy variable "1", while non-family business is set to be "0".

3.3 Control Variables

According to literature review, we selected company size (SIZE), business risk (RISK), financial leverage (DEBT), CEO duality (DUAL), board director ownership (DIROWN), percentage of shares held by major shareholders (BLOCK), institutional investor ownership (INST) and industry category (IND) to be control variables (Shleifer & Vishny, 1986; Lang & Stulz, 1994; Berger & Ofek, 1995; Cho, 1998; Mansi & Reeb, 2002; Wright et al., 2002).

The variable of company size (SIZE) is defined that a log of total assets; this study uses the standard deviation of ROA over the past 3 years to measure business risk (RISK); financial leverage (DBET) is defined total liabilities divided by total assets; the return on assets for the previous year (ROA) is used to measure prior performance (ROA= (Net income + interest expenses) × (1 - tax rate) / average total assets); this study sets CEO duality (DUAL) is dummy variable which DUAL is set as 1, whereas 0; the ratio of outside director seats (OUTDIR) is the number of outside board directors by the end of the previous year divided to the total number of board directors (outside directors are defined as those not-employed by the company, or non-board members of affiliates companies, including employees, or spouses and relatives within the second degree of consanguinity); board of director ownership (DIROWN) is defined as the percentage of outstanding shares held by the board of director; percentage of shareholding held by major shareholders (BLOCK) is measured the ratio of the number of shares held by major shareholders to the total number of outstanding shares (according to the Taiwan Securities and Exchange Act, major shareholders are defined as individuals holding more than 10% of shares); institutional investor ownership (INST) is defined as the percentage of outstanding shares held by the board of director; industry category is the dummy variable, which is set to be 1, otherwise 0.

4. Empirical Result

4.1 Univariate Analysis

Table 1 shows the calculated descriptive statistics for all variables, and the mean differences t test and nonparametric Mann-Whitney U test results for family and non-family variable differences. The results showed that the diversification index (DIV) for total sample mean (median) of 0.478 (0.480). Also, the mean (median) for diversified family business is 0.497 (0.510) which is more than the mean for non-family business for 0.458 (0.450). There are significant differences in diversification index (DIV) between family and non-family business. It implies that family business enhances diversification more than non-family business. In addition, the mean (median) for managerial ownership (OWN) is 2.870 (0.925); the mean (median) for managerial ownership in family businesses is 3.167 (1.080) which is greater than the mean for managerial ownership in non-family businesses. It shows significant differences in managerial ownership between family and non family business. The control variables, included company size (SIZE), business risk (RISK), financial leverage (DEBT), industry category (IND), prior performance (ROA), CEO duality (DUAL), the percentage of outside board directors (OUTDIR), board director ownership (DIROWN), percentage of shares held by major shareholders (BLOCK) and institutional investors' ownership (INST), are significant difference between the family and non-family samples.

The Pearson correlation coefficient matrix for of the variables is shown in Table 2. The diversification (DIV) and family variables (FB) are significantly positively correlated (0.045), while the levels of diversification (DIV) and managerial ownership (OWN) are negatively correlated (-0.012), but not significant. The largest correlation coefficients for the remaining variables are company size (SIZE) and institutional investor ownership (INST),

with a value of 0.492. In addition, this study computed the Variance Inflation Factors (VIF) which shows all variables are all less than 10, indicating negligible multicollinearity problems.

4.2 Multivariate Analysis

4.2.1 Measurement of the Impact of Managerial Ownership on the Subsequent Diversification

Table 3 shows the results obtained using panel data regression analysis for models 1, 2, 3 and 4. First, we examine the impact of key variables on diversification in the tth period. It is found that there is an insignificant relationship between business ownership and subsequent diversification. However, in the $t+1^{th}$ period, there is a significant negative correlative between non-family business ownership and subsequent diversification, and family business ownership shows a significant positive correlation with the subsequent diversification, consistent with hypothesis 1-1 and 1-2. In addition, this means that there exists a deferred effect between managerial ownership and diversification in the tth and $t+1^{th}$ period.

Moreover, the significant negative correlation between non-family business ownership and subsequent diversification means the higher level of the managerial ownership, the interests linked to the owners, and the less the destructive behavior for company value, consistent with Denis, Denis and Sarin (1997). Meanwhile, the greater ownership will offset the managerial benefit received from diversification. Therefore, a higher level of ownership will lead to a lower level of diversification behavior. In addition, the positive correlation, which reaches significant levels between the ratio of family business ownership and subsequent diversification, indicates that in the family business the wealth of minority shareholders may be exploited as family members seek to maximize their own interests. Although diversification may reduce the value of the company, the controlling power and claims right of earnings distribution have a greater deviation in Taiwan, because of complicated pyramidal structure and cross-holdings of family businesses, and weak protection of investors and minority shareholders. Therefore, family business uses diversification to exploit minority shareholders. This means that when the level of manager ownership in the family business is enlarged, the level of the diversification will be increased.

Table 1. Descriptive statistics

Variable	Mean				Median			
	Total Sample	Family Sample	Non-Family Sample	t-test	Total Sample	Family Sample	Non-Family Sample	Mann-Whitney U test--z value
DIV	0.478	0.497	0.458	2.831***	0.480	0.510	0.450	-3.375***
OWN	2.870	3.167	2.572	3.852***	0.925	1.080	0.770	-1.856*
SIZE	3.676	3.645	3.707	-2.876***	3.631	3.577	3.685	-4.220***
RISK	4.143	3.696	4.591	-6.520***	2.910	2.626	3.193	-5.997***
DEBT	0.445	0.445	0.446	-0.126	0.454	0.455	0.452	-0.044
IND	0.482	0.617	0.348	17.481***	0.500	1.000	0.000	-16.859***
ROA	5.792	5.807	5.776	0.090	5.550	5.120	5.980	-2.283**
DUAL	0.293	0.250	0.335	-5.824***	0.000	0.000	0.000	-5.800***
OUTDIR	0.351	0.289	0.412	-17.585***	0.358	0.286	0.429	-16.961***
DIROWN	0.200	0.250	0.149	24.106***	0.174	0.221	0.126	-25.742***
BLOCK	1.718	2.581	0.856	8.026***	0.000	0.000	0.000	-8.924***
INST	38.553	42.736	34.370	11.469***	36.098	40.995	31.200	-10.879***
Observations	3,642	2,169	1,473		3,642	2,169	1,473	

Note. * indicates the 10% significance level; ** indicates the 5% significance level; *** indicates the 1% significance level; DIV: Diversification; FB: Family Businesses; OWN: Managerial Ownership; SIZE: Company Size; RISK: Business Risk; DEBT: Financial Leverage; IND: Industry Category; ROA: Prior Performance; DU AL: CEO Duality; OUTDIR: Percentage of Outside Directors; DIROWN: Board Director Ownership; BLOCK: Percentage of Shares Held by Major Shareholders; INST: Institutional Investor Ownership.

Table 2. Pearson correlation (full sample)

	DIV	FB	OWN	SIZE	RISK	DEBT
DIV	1					
FB	0.045**	1				
OWN	-0.012	0.061**	1			
SIZE	0.017	-0.046**	-0.176**	1		
RISK	-0.061**	-0.103**	0.009	-0.077**	1	
DEBT	0.070**	-0.002	-0.087**	-0.101**	0.045**	1
IND	0.068**	0.265**	-0.066**	-0.141**	-0.199**	0.112**
ROA	0.008	0.001	0.046**	0.440**	-0.070*	-0.317**
DUAL	-0.035*	-0.092**	0.411**	-0.118**	0.035*	-0.019
OUTDIR	-0.034*	-0.274**	0.064**	-0.053**	0.045**	-0.075**
DIROWN	0.047**	0.357**	0.083**	0.008	-0.020	-0.046**
BLOCK	-0.018	0.126**	0.002	-0.070**	0.021	0.047**
INST	0.000	0.179**	-0.301**	0.492**	-0.053**	-0.018

Table 2. Continued

	IND	ROA	DUAL	OUTDIR	DIROWN	BLOCK	INST
DIV							
FB							
OWN							
SIZE							
RISK							
DEBT							
IND	1						
ROA	-0.126**	1					
DUAL	-0.082**	-0.061**	1				
OUTDIR	-0.215**	0.106**	0.040*	1			
DIROWN	0.051**	0.119**	-0.121**	0.021	1		
BLOCK	0.093**	-0.072**	0.010	-0.024	-0.068**	1	
INST	0.056**	0.263**	-0.156**	0.028	0.420**	0.163**	1

Note. * When the significance level is at 0.05 (two-tailed), it will be significantly relevant; ** When the significance level is at 0.01 (two-tailed), it will be significantly relevant; DIV: Diversification; FB: Family Businesses; OWN: Managerial Ownership; SIZE : Company Size; RISK: Business Risk; DEBT: Financial Leverage; IND :Industry Category; ROA: Prior Performance; DU AL: CEO Duality; OUTDIR: Percentage of Outside Directors; DIROWN: Board Director Ownership; BLOCK : Percentage of Shares Held by Major Shareholders; INST: Institutional Investor Ownership.

Table 3. The relationship between managerial ownership and subsequent diversification

	Family (FB)		Non-Family (NFB)	
Variable	DIV t[th] period	DIV t+1th period	DIV t[th] period	DIV t+1th period
C	0.216**	0.431***	0.221**	0.445***
	(2.003)	(5.125)	(2.046)	(5.292)
FBOWN/NFBOWN	**-0.001**	**0.003**	**-0.002**	**-0.003**
	(-0.379)	(2.220)	(-1.001)	(-2.348)
SIZE	0.039	0.000	0.038	-0.002
	(1.375)	(0.005)	(1.363)	(-0.076)
RISK	0.000	0.000	0.000	0.000
	(0.173)	(0.124)	(0.186)	(0.123)
DEBT	0.103*	0.057*	0.101*	0.055*
	(1.810)	(1.667)	(1.770)	(1.795)
ROA	0.000	0.000	0.000	0.000
	(0.114)	(0.477)	(0.120)	(0.473)
DUAL	-0.006	-0.006	-0.005	-0.004
	(-0.361)	(-0.506)	(-0.311)	(-0.291)

OUTDIR	0.020	-0.030	0.023	-0.031
	(0.703)	(-1.418)	(0.798)	(-1.487)
DIROWN	0.250**	0.205***	0.245**	0.216***
	(2.585)	(2.866)	(2.566)	(3.008)
BLOCK	-0.001*	-0.002*	-0.001*	-0.002*
	(-1.669)	(-1.788)	(-1.695)	(-1.808)
INST	0.001	0.001	0.001	0.001
	(0.841)	(0.480)	(0.767)	(0.404)
R^2	0.753	0.903	0.762	0.914
Adj. R^2	0.732	0.894	0.733	0.894
F value	15.533***	39.103***	15.539***	39.070***
Observations	3642	3048	3642	3048

Note. * When the significance level is at 0.10, it will be significantly relevant; ** When the significance level is at 0.05, it will be significantly relevant; **, *When the significance level is at 0.01, it will be significantly relevant; FB: Family Businesses; NFB: Nonfamily Business; DIV: Diversification; FBOWN: Family Businesses Managerial Ownership; NFBOWN: Nonfamily Businesses Managerial Ownership; SIZE : Company Size; RISK: Business Risk; DEBT: Financial Leverage; IND : Industry Category; ROA: Prior Performance; DU AL: CEO Duality; OUTDIR: Percentage of Outside Directors; DIROWN: Board Director Ownership; BLOCK : Percentage of Shares Held by Major Shareholders; INST: Institutional Investor Ownership.

4.2.2 Measurement of the Impact of Diversification on the Subsequent Managerial Ownership

Table 4. The relationship between diversification and subsequent managerial ownership

	Family (FB)		Non-family (NFB)	
Variable	FBOWN t^{th} period	FBOWN $t+1^{th}$ period	NFBOWN t^{th} period	NFBOWN $t+1^{th}$ period
C	-1.300	3.290**	1.717**	1.749*
	(-1.062)	(2.206)	(1.997)	(1.667)
DIV	**-0.079**	**0.804****	**-0.147**	**-0.445****
	(-0.379)	(2.220)	(-1.001)	(-2.248)
SIZE	0.299	0.747*	-0.061	0.062
	(0.935)	(1.959)	(-0.273)	(0.231)
RISK	-0.011	0.000	0.005	-0.000
	(-0.697)	(0.011)	(0.451)	(-0.029)
DEBT	1.216*	0.388*	-0.668*	-1.301**
	(1.884)	(1.670)	(-1.772)	(-2.480)
ROA	0.011	-0.000	0.005	-0.000
	(1.251)	(-0.007)	(0.833)	(-0.116)
DUAL	1.945***	0.783***	0.920***	0.259*
	(10.006)	(3.472)	(6.739)	(1.683)
OUTDIR	-0.933***	-0.376	-0.947***	-0.166
	(-2.872)	(-1.005)	(-4.151)	(-0.631)
DIROWN	9.094***	2.078	0.362	1.643*
	(8.395)	(1.640)	(0.476)	(1.842)
BLOCK	0.050***	-0.032**	-0.002	-0.023**
	(3.858)	(-2.323)	(-0.255)	(-2.021)
INST	-0.015**	-0.005*	-0.021***	-0.015***
	(-2.463)	(-1.764)	(-4.853)	(-3.071)
R^2	0.695	0.674	0.603	0.587
Adj. R^2	0.650	0.637	0.566	0.530
F value	10.837***	8.909***	7.910***	6.087***
Observations	3642	3048	3642	3048

Note. * When the significance level is at 0.10, it will be significantly relevant; ** When the significance level is at 0.05, it will be significantly relevant; **, *When the significance level is at 0.01, it will be significantly relevant; FB: Family Businesses; NFB: Nonfamily Business; FBOWN: Family Businesses Managerial Ownership; NFBOWN: Nonfamily Businesses Managerial Ownership; DIV: Diversification; SIZE : Company Size; RISK: Business Risk; DEBT: Financial Leverage; IND : Industry Category; ROA: Prior Performance; DU AL: CEO Duality; OUTDIR: Percentage of Outside Directors; DIROWN: Board Director Ownership; BLOCK : Percentage of Shares Held by Major Shareholders; INST: Institutional Investor Ownership.

Table 4 shows that the panel data regression analysis results for models 5, 6, 7 and 8. First, when we look at the impact of the major variable on managerial ownership, only in t+1th period, there is a negative and significant

correlation between non-family business diversification and subsequent managerial ownership, and is a positive significant correlation in family business, consistent with hypothesis 2-1 and 2-2. In addition, this means that there exists a deferred effect between diversification and managerial ownership in the tth and $t+1^{th}$ period.

Moreover, the significantly negative correlation between non-family business diversification and subsequent managerial ownership indicates that if a diversification strategy is carried out to strengthen the reputation in the company, this will undermine the value of the business. This means that managers will reduce their level of ownership in order to avoid damaging personal interests. This means that managers will have not a positive linkage to increase the level of ownership managers in order to higher diversification. Thus, this implies the higher the level of diversification in non-family businesses and the lower the degree of managerial ownership. In addition, the significantly positive correlation between family business diversification and subsequent managerial ownership reveals that family business managers increase their ownership to increase control rights of family business after minority shareholders will sell their stock. Thus, in order to strengthen the status of the family business, the amount of managerial ownership will be enlarged after diversification.

5. Conclusion

This study investigates the dynamic relationship between managerial ownership and diversification under different ownership structures.

The empirical results show that in non-family business the impact of managerial ownership on the subsequent diversification is significant negative and support the hypothesis 1-1 in this study. This implies that the increased managerial ownership leads to less subsequently destructive company value for avoiding personal interest risk. In family businesses, managerial ownership is positively correlated to the subsequent diversification, consistent with hypothesis 1-2. This indicates that family business managers will enlarge the level of diversification in order to exploit minority shareholders, because family members' wealth is concentrated in family business.

Diversification is significantly negatively correlated with subsequent managerial ownership in non-family businesses. This means that managers will reduce their level of ownership in order to avoid damaging personal interests. In contrast, diversification is significantly positively related to the subsequent managerial ownership in family businesses. It can be inferred that, since the family regards the business as an asset which could be passed on to their descendants, the survival of the business is the primary objective. However, to avoid diversification to exploit minority shareholders, minority shareholders will decrease right, as a result, family business managers will increase their ownership after diversification.

The findings of this study provide several implications for companies, investors and governments. First, for firms, the relationship between managerial ownership and diversification will change over time. Moreover, in the family business, diversification may be a good tool for preserving interests for next generations and for speculation and exploitation of the interests of minority shareholders. Second, for perspective investors, they should understand family businesses and non-family businesses both have different dynamic relationships between managerial ownership and diversification, in order to facilitate investment decisions. Third, government might establish a sound monitor system to watch the change of managerial ownership and diversification (especially, the family business), as well as announce them periodically.

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Notes

Note 1. Upon Economic Cooperation Framework Agreement (ECFA) accession, Taiwan and Mainland China will both open up their finance and stock market, including banks, insurance and stock finance services. Other countries can enter one area first and then use the ECFA to enter both markets for the preferential policy.

Note 2. Since both cross-sectional and time series data are utilized, the Likelihood Ratio Test is first used to verify whether we should use the ordinary least squares, or PLS (Panel Least Squares) method for regression

analysis. After that, the Hausman Test is used to determine whether fixed effects or random effects should be used in the estimation model. The results showed that the fixed effects model is superior to the ordinary least squares or random effect model.

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Capital Structure and Financing of SMEs: The Tunisian Case

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Abstract

This article contributes to analyze the determinants of the capital structure of 611 tunisian small and medium-sized enterprises (SME's), observed on a duration of six years. We will wonder about the impact of the financial specificities of the SME on their financial structures. For that purpose, we will confront hypotheses of the financial theory with the reality of the SME's. The estimations conducted, via the within model, show that the financial structure is not neutral and that the cost of financing, the profitability and the commercial debt are the main determinants on the banking debts. The estimations also reveal a hierarchy followed by SME's, in their financial choice, favoring the financing by internal funds and by commercial debts. A business sector analysis shows greater financing difficulties for the SME's providing services compared to the industrial SME's.

Keywords: SME, capital structure, financing, panel data

1. Introduction

Small and medium enterprises (SMEs) are the dominant form of business organizations in their contribution to socio-economic development, creating jobs and wealth, both in developing and in developed economies (Gregory et al., 2005; Hussain et al., 2006; Daskalakis & Psillaki, 2008). In Tunisia, SMEs are the main driver of the economy, accounting for almost 90% of the economic fabric and employ more than 50% of the workforce in the private sector (APII, 2010) (Note 1). Despite the importance of SMEs, most of the literature on SMEs suggests that these companies face financing difficulties that limit their growth and development (Gregory et al., 2005; Coluzzi et al., 2009; Ardict et al., 2012). Compared with large enterprises, SMEs are handicapped as for the access to financing from financial institutions and especially for long-term loans. These external funding problems result mainly from the inability of donors of funds to estimate the degree of risk associated with these small entities, which may not provide a basis of reliable information or adequate collateral security. SMEs are characterized firstly by a lack of equity that weakens their solvency (Allegret, 1995). Then, they are associated with a high risk of exploitation mainly due to the lack of diversification of their activities, their limited financial expertise and the lack of separation between the ownership, decision and control functions (Ang, 1992). A large part of the research works deals with the subject of the policy of corporate finance. Although many previous empirical studies have examined the financing of large firms, much less attention is paid to small structures, particularly in transition economies (Hutchinson & Xavier, 2006 for Slovenia; Mateev et al., 2013 for Eastern Europe). On a theoretical level, it is difficult to identify an underlying framework for SMEs to assimilate their financial operation. First, even though several theories have already been developed to explain the corporate debt structure, there is still no consensus theory on which managers can rely to determine an optimal level of debt (Sheikh & Wang, 2011; Colot & Croquet, 2007). Nearly forty years after the pioneers articles of Modigliani and Miller (1958, 1963), we still do not have theories that can explain and guide the choice of corporate financing. Second, SMEs are not perfectly integrated into the Founder financial framework, since the existing theories generally relate to large listed companies. It is possible that some of the mechanisms highlighted in this context are not applicable to the universe of unlisted SMEs. This lack of theoretical framework is a serious handicap to understand and analyze the financial behavior of SMEs. It is in this context that the issue of this study is registered. The objective is to examine the major determinants of the debt ratio by focusing on the impact of financial specificities of SMEs on their capital structure. Our study is organized as follows. Section 2 is devoted to a review of the literature that examines how theories of financing structure can be applied in the context of small businesses. Section 3 presents the potential determinants of the bank debt as well as the empirical hypotheses to be tested. Section 4 describes the

characteristics of the sample and the methodology. We will discuss the results of our empirical study in Section 5. The last section concludes the paper.

2. Review of Theories of Capital Structure

The modern theory of the financial structure of companies goes back to the works of Modigliani and Miller (1958). They point out that under certain conditions, all forms of financing are equivalent and therefore the value of the firm is independent of its financial structure. This principle of neutrality has been widely criticized, particularly in regard to its non-applicability. In order to bring their model to the financial reality, Modigliani and Miller (1963) take into account the tax, including the deductibility of financial interest on the taxable income. They show that the value of the leveraged firm is greater than that of a firm without debt, due to the debt tax shield. However, any increase in the level of debt reduces this value because of the existence of the risk of bankruptcy (Stiglitz, 1969). The existence of bankruptcy costs coupled with the existence of tax advantages, allow to determine an optimal debt level, obtained when the marginal benefits bound to the deductibility of interest charges and the marginal bankruptcy costs associated with increased debt are equal.

In the same way, the lifting of the hypothesis of absence of agency costs can also determine an optimal capital structure (Jensen & Meckling, 1976). Agency costs are generated following the conflicts of interest between managers-shareholders and creditors on the one hand, and between the managers of the company and shareholders on the other hand. SMEs are unlikely to suffer from this second type of conflict, due to the non-separation between the functions of owner and manager. However, conflicts which oppose the creditors to the managers are important and suppose that the latter can divert some of the wealth of their firm at the expense of the creditors. This is possible if the company chooses investment projects whose level of risk is higher than initially expected by the creditors (risk of asset substitution), or when it renounces profitable investment projects (risk of under-investment). SMEs are often characterized by high flexibility of its management which allows it to change quickly the characteristics of its projects. The creditors anticipate this opportunist character of the managers and ask for a rather high financing premium to protect themselves. As a result, Myers (1977) points out that companies with high growth opportunities are not interested in the issue of risky long-term debt risky, that reduce investment opportunities and led to the abandonment of projects economically profitable. Faced with these problems of asset substitution and under-investment, Jensen and Meckling (1976), Myers (1977) and Titman and Wessels (1988) recommend the use of short-term debt in companies with strong growth opportunities. The bankruptcy and the agency costs constitute the essence of the Trade Off Theory, because it is based on a compromise between the costs and benefits of debt (Dufour & Molay, 2010).

By removing the hypothesis of perfect information, many reflections were developed to reduce the information asymmetries, such as signal theory and the pecking order theory. Unlike theories which have been presented, these theories do not provide an optimal debt ratio. The transmission of signals by the company in the form of disclosure information can reduce the information asymmetry and thus make easier the obtaining of debt financing on favorable conditions. The concentration of ownership and involvement of managers is therefore a positive signal about the quality of the company (Leland & Pyle, 1977). Also, a high level of debt is a good signal on the creditworthiness of the company and thus favors the increase of the debts (Ross, 1977). The verification of this theory to the financial reality of SMEs, based on the one hand, on the higher involvement of the managers in the capital and, on the other hand on the over-indebtedness of these companies. Signaling by the debt ratio can not only reduce the risk of undervaluing the company, but also reduce the risk of sub-optimal investment strategy engendered by the opening of the capital. It results a hierarchical order of preference in the ways of financing. The pecking order theory founded by Myers and Majluf (1984) is interested in the choices of financing options determined by their level of information asymmetries and proposes the order: equity–not risky debt–risky debt–opening of the capital. Ang (1991) points out that this theory is easily applied in the context of SMEs which do not seek an optimal financial structure, but whose financing decisions aim at ordering their financing preferences. The manager of the SMEs, having for objective the maximization of their own wealth and anxious to be exposed to the financial discipline imposed by the shareholders and creditors on the one hand, and the dilution of ownership property on the other hand, prefers the internal financing. However, in case of insufficient internal funds, it is preferable to use the debt, rather than raising capital from new investors, so as not to harm existing shareholders. Several studies have examined the empirical validity of the theories of capital structure, and tried to figure out which one is most capable to explain the decisions of corporate finance, but no consensus exists yet, even in the context of developed economies (Sheikh & Wang, 2011). This returns to the fact that the points on which these theories emphasize differ from one theory to another. Despite that there is no universal theory of financing choices (Myers, 2001), the above-mentioned theories can provide a theoretical basis for understanding the financial behavior in particular in the determination of the factors that influence the

financing policy of companies.

3. Determinants of Debt Structure

To identify the determinants of bank debt, we rely on previous studies on this subject which offer a multitude of indicators, supposed to have a significant impact on the bank debt of SMEs. Within the limit of the availability of the data of our study, we select a set of potential determinants of the debt. From these, we formulate hypotheses to be tested on a panel of Tunisian SMEs.

Trade-Off-Theory

The cost of financing.

The deductibility of costs of interest from taxable income increased the appeal to debt rather than equity, from which the remunerations are not deductible. However, the debt increased fixed obligations of the company, so the risk of bankruptcy. The debt level of equilibrium is reached after arbitration between the deductibility of interest costs and marginal bankruptcy costs. The tax benefits of financial debt are reduced in SMEs because of the risk of bankruptcy, which explains their limited debt (Pettit & Singer, 1985; Ang, 1991, 1992; Michaelas et al., 1999. Ziane, 2004). Our first hypothesis is:

H1: Financial interests incite SMEs to reduce their debt (Note3).

The risk.

According to the Trade-Off theory, leveraged firms must periodically pay principal and interest of their debts. However, a high variability of flows increases their bankruptcy risk. Castanias (1983), Bradley et al. (1984), Titman and Wessels (1988), Mackie-Mason (1990), Jensen et al. (1992), Fama and French (2002), Jong et al. (2008) and Sheikh and Wang (2011) suggest that riskier firms tend to reduce their reliance on debt because of the increase of the failure risk with the uncertainty of their cash-flows. Thus, our second hypothesis is as follows:

H2: the volatility of operating income has a negative impact on debt

Agency theory.

Growth opportunities.

The asset substitution problem assumes that high levels of debt may encourage managers to invest in very risky projects, which leads to a transfer of wealth from creditors to managers. Thus, opportunities for significant growth lead to high agency costs that reduce long-term debt. According to Myers (1977), firms with high growth opportunities replace the long-term debt by short-term debt. Therefore, growth opportunities have a negative impact on long-term debt (Titman & Wessels, 1988; Rajan & Zingales, 1995; Johnson, 1997; Scherr & Hulburt, 2001; Hovakimian et al., 2004; Huang & Song, 2006), and positive on short-term debt (Dubois, 1985; Weill, 2002). Regarding SMEs, which favors short-term debts, the impact of growth opportunities on leverage will be positive (Voulgaris et al., 2004; Mateev et al., 2013).

H3: growth opportunities are positively correlated with debt.

Guarantees.

The existence of debt's agency costs arising from the problems of adverse selection and moral hazard incites the creditors to demand guarantees (Myers, 1977; Scott, 1977; Harris & Raviv, 1991). The rigidity of the assets can solve these agency problems by reducing opportunistic behavior of the manager, which increases the possibility of debt (Stiglitz & Weiss, 1981; Titman & Wessels, 1988). The guarantees reduce credit risk by retaining these tangible assets, if the company cannot honor its debt. The concentration of capital increases the risks of managerial opportunism and asset substitution in small businesses (Michaelas et al., 1999; Cassar & Holmes, 2003; Adaskou & Adair, 2011). A positive relationship between the amount of guarantees and the debt seems to exist (Bester, 1985; Long & Malitz, 1985; Bourdieu & Sédillot 1993; Bias et al., 1995; Rajan & Zingales, 1995; Bédué & Levy, 1997; Hovakimian et al., 2004; Huang & Song, 2006; Jong et al., 2008). Our third hypothesis is as follows:

H4: Guarantees have a positive impact on debt of SME's.

Signal theory.

Rentability.

According to Diamond (1984) and Sharpe (1990), good corporate reputation has a positive impact on its relations with creditors. Financial rentability is a good signal on the financial viability of the company and plays an important role in the appreciation of the company by creditors and also in the financial choices by the

managers (Coleman & Carsky, 1999; Bhaduri, 2002; Panno, 2003). This idea is confirmed by the Trade Off theory, which predicts that the most profitable companies are those most indebted for tax benefits. Thus, a profitable firm has stronger probability to pay off its debts (Shyam, Sunder, & Myers, 1999). So, we propose the following hypothesis:

H5: The financial rentability has a positive impact on debt.

The commercial debts.

Diamond (1984) considers that the use of debt by SME's depends on its reputation among its commercial partners. A company is trying to reassure its business partners such as customers or suppliers on its ability to meet its commitments. According to the theory of signal, suppliers' credits may reflect the reputation of companies towards their commercial partners (Leland & Pyle, 1977; Ross, 1977). Thus, banks refer to commercial loans to judge the reliability and creditworthiness of the company. A high amount of commercial debt encourages banks to give credits. Our hypothesis is:

H6: there is a positive relationship between commercial debts and financial debts.

The size.

Several authors support the positive impact of size on debt decisions (Warner, 1977; Ang et al., 1982; Dubois, 1985; Titman & Wessels, 1988; Rajan & Zingales, 1995; Bédué & Levy 1997; Booth et al., 2001; Voulgaris et al., 2004; Aghion et al., 2004; Huang & Song, 2006; Sheikh & Wang, 2011; Mateev et al., 2013). The existence of economies of scale associated with the diversification of the activities of large enterprises, reduces the volatility of their results (Fama & French, 2002). Size is considered as a good signal as far as the more the size of the company is important and the more it is diversified, the more the risk of failure is reduced. This positive sign is also justified by the agency and the Trade-Off-Theory. We so formulate our seventh hypothesis:

H7: The size of the company and debt are positively correlated.

Pecking order theory.

The consideration of the costs associated to the problem of asymmetry information creates a hierarchy between the different sources of funding: internal financing, low-risk debt (bank loans), risky debt (bonds) and capital increase (Myers & Majluf, 1984). Being little sensitive to the asymmetry of information, the debt can be obtained with a lower risk of undervaluation than in case of share issue. Indeed, companies are resorting to debt considered the unique significant source of external liquidity for the majority of SMEs, only when their internal resources are exhausted. To test the hypothesis of the existence of pecking order, several authors establish a negative relationship between profitability and the debts (Titman & Wessels, 1988; Biais et al., 1995; Harris & Raviv, 1991; Jensen et al., 1992; Carpentier & Suret, 2000; Booth et al., 2001; Chen, 2004; Fama & French, 2005; Huang & Song, 2006, Magri, 2009; Sheikh & Wang, 2011). Profitability increases the internal resources of the company and therefore reduces reliance on external debt. This is also confirmed for small firms (Rajan & Zingales, 1995; Cassar & Holmes, 2003; Ziane, 2004; Sogorb-Mira, 2005, Vos et al., 2007; Psillaki & Daskalakis, 2008; Mateev et al., 2013). To verify the existence of a hierarchy of financing, De Haan and Hinloopen (2003) test the following two hypotheses:

H8: Profitability is negatively related to debt.

H9: There is a negative relationship between corporate liquidity and debt.

Viviani (2008), Hirth and Uhrig-Homburg (2010), Sheikh and Wang (2011) and Mateev et al. (2013) argue that liquidity is a key determinant of the level of debt factor, and can reduce debt agency costs. However, the impact of liquidity can also be positive in the context of signal theory, insofar as they have a good signal on the financial situation of the company.

4. Methodology

4.1 The Sample

The sample data used to estimate our model are obtained from the Central Bank of Tunisia (BCT) from the unit Central Balance Sheet. We did not have the opportunity to choose our sample on the basis of the definition most commonly used in Tunisia, according to which the SME is an enterprise employing between 10 and 200 employees, nor to test for the presence of selection bias in our sample compared to the whole sample of the database of the BCT. This database is newly created and is under construction. All the criteria allowing to reveal the accounting identity of firms such as the company name, the address and the phone number are eliminated. The number of employees as well as the interest rate are also masked. The selection of the final sample is made through the

following steps. First time we have chosen all companies for all services. Our sample consists of 1,790 SMEs. According to the BCT, any company making investments not exceeding five million dinars in the activities of manufacturing, crafts and some services is classified as SMEs (Note 2). This database is consisted entirely by non-listed companies, privately owned and not being a part of a group of companies. According to BCT this could be a criterion for defining SMEs. We subsequently eliminated companies with missing or unreliable data which reduces the sample to 1760 firms over a period of 6 years (2004–2009).

Note that the data on each company in our sample sometimes cover the entire period (2004–2009), sometimes a longer or shorter period which makes our initial panel incomplete or not rolled. We chose to keep only firms with data on the period of 6 years. The choice of data over the entire period is justified by the dynamic nature of our model which supposes the inclusion of delays. The choice of a balanced panel results from the necessity of testing the model over several years, by using the largest number of econometric tools. Our final sample includes 611 firms observed over a period of six years from 2004 to 2009.

4.2 Definitions and Measures of Variables

4.2.1 The Dependent Variable

In our analysis, we propose to use an accounting measure of debt. This choice is justified by the nature of our sample composed of unlisted SMEs. To determine the debt level of the company, two accounting measures are also possible in the empirical literature. The first retains the total debt ratio regardless of maturities (Jensen et al., 1992; Rajan & Zingales, 1995). The second distinguishes the short-term debt to long-term debt (Titman & Wessels, 1988). We were obliged to choose the first accounting approach, because of the unavailability of data. The dependent variable in our model is measured by the debt ratio, which is equal to the total debt reported to total assets in accordance with Bias et al. (1995), Suret and Carpentier (2000), Dufour and Molay (2010) and Sheikh and Wang (2011). The choice of total assets is justified by the neutralization of the size effect which will be taken into account as an explanatory variable. We chose to exclude commercial debts because they are important and are substitutable for financial debts in SMEs.

4.2.2 Explanatory Variables

Table 1 shows the definition and the measurement of variables, and also the expected signs. Descriptive statistics for all variables are presented in Appendix 1. Based on the empirical literature, we select the following variables:

The cost of financing: the information extracted from the balance sheets of companies do not allow us to measure the costs associated to debts. Only the financial costs can be determined from the paid interests. Not having access to the interest rates, we measure the cost of financing by the sum of financial expenses reported to the amount of the financial debt (Ziane, 2004).

The risk: Operational risk is often measured with volatility in operating results and / or net income. In our analysis we measure this variable by the change in net income of the company from one year to another (Titman & Wessels, 1988; Booth et al., 2001).

Growth opportunities: are measured by a vast ange of variables. According to Lopez-Gracia and Sogorb Mira (2008), this variable reflects the ability of the enterprise to generate internal funds. Titman and Wessels (1988) use the ratio of R & D on turnover. Jensen et al. (1992) and Chittenden et al. (1996) retain the growth rate of sales. In our study, we measure growth opportunities by the variation of total assets (Bias et al., 1995; Michaelas et al., 1999; Suret & Carpentier, 2000).

Guarantees: Banks generally require collateral when they grant credits to SMEs, particularly in case of long-term debt. This is a necessary condition according to Berger and Udell (1998). Collateral reduce the autonomy of managers who invest only in projects initially planned for fear of losing their assets presented as collateral security. We try to measure the guarantees by the sum of tangible assets reported to total assets (Bourdieu & Colin Sédillot, 1993; Mateev et al., 2013).

Rentability: As an indicator of business performance, financial rentability plays an important role in assessing the company by creditors, and also in the choice of financial policy by managers (Myers, 1977). It seems important to understand the effect of this variable on the debt. Financial rentability is measured by the net income reported to total equity (total equity before appropriation).

Commercial debts: constitute an indicator on the creditworthiness of the company on payment of their debts towards commercial partners. This good signal increases the confidence of banks and favors debt. However, some authors such as Petersen and Rajan (1994) argue that commercial debt is a substitute for financial debt in companies rationed, which decreases the granting of credit by banks. The commercial debts will be measured by

the sum of suppliers debts reported to the total assets.

Profitability: is an indicator of the ability of the company to generate profits from its investments. These gains have a significant impact on the financial choice in companies. In our model, we measure profitability with net income divided by total assets.

Liquidities: highlight the existence of liquidity at the company. They indicate whether the company has internal resources. These liquidities in the hands of managers are not without impact on debt policy. According to Hirth and Uhrig-Homburg (2010), liquid funds represent a decision variable on the level of debt. Liquidity is measured by the amount of liquidity and equivalent liquidity reported on total assets.

The size: the size of the company is one of the most discriminating factors when granting loans by banking institutions (Bradley et al., 1984; Long & Malitz, 1985; Harris & Raviv, 1991; Rajan & Zingales, 1995). Hadlock and Pierce (2010) suggest that the size and age of the company are good indicators of the level of financial constraints. To measure the size, several indicators have been used in the empirical literature, such as the logarithm of turnover, number of employees, the amount of fixed assets, etc. In our study, we use the logarithm of total assets according to Bédué and Levy (1997) and Mateev et al. (2013).

Table 1. Summary of variables and expected relationships

Variable	Definition	Measure	Expected Sign
ENDT	Debt Ratio	financial debts / Total assets	/
INT	Cost of financing	Financial expenses / financial debts	-
CROIS	Growth opportunities	variation of total assets	+
GART	Guarantees	Tangible assets / total assets	+
RSQ	Risk	Variation of net income	-
RENT	Rentability	net income / total equity	+
DCOM	Commercial debts	Supplier debts / total assets	+
PROF	Profitability	Net income/ total assets	-
LIQ	Liquidities	Liquidities and equivalent liquidities / total assets	-
TAIL	Size	Log (total assets)	+

4.3 Method of Analysis

The econometrics of panel data allows to test the defined theoretical hypotheses. The main advantage of panel data is to explain the behavior of individuals over several years, by identifying the dynamic effects between individuals, not detected by cross-sectional data (Baltagi, 1995). The study of data from corporate balance sheets is generally made according to the methods of econometrics of panel data. They allow to highlight the heterogeneity of the observations and control the individual effects, neither by the inclusion of a specific effect assumed certain (fixed effects) or by the inclusion of a specific unobservable effect (random effects). In addition, introducing delayed variables distinguishes between the static and the dynamic model. Indeed, the presence of a lagged endogenous variable among the explanatory variables leads to biased estimations, due to the correlation of the endogenous variable with the error term. These estimators are biased especially when the study period T is limited (Sevestre, 2002). This is our case, since the observation period is 6 years. However, efficient estimators such as Generalized Method of Moments (GMM) are used to take into account the endogeneity of explanatory variables and dynamic aspect of models (Blundell & Bond, 1998). However, the estimation of econometric models by the dynamic approach is tested over long periods. An estimation over a period of T years requires at least T+2 years of observations. Thus, we use techniques of static estimations according to the works done based often on the static model. Our model is composed of 8 explanatory variables, to which we add a constant (α) and an error term (ε). Thus, our model is the following:

$$ENDT_{it} = \alpha + \beta_1 INT_{it} + \beta_2 RSQ_{it} + \beta_3 DCOM_{it} + \beta_4 RENT_{it} + \beta_5 PROF_{it} + \beta_6 TAIL +$$
$$\beta_7 GART_{it} + \beta_8 LIQ_{it} + \beta_9 CROIS_{it} + \varepsilon_{it}$$

With: i the number of SMEs, i = 1….611; t the number of years, $t = 1 ..... 6$; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ and β_9 are the unknown parameters of the model.

5. Empirical Results and Interpretations

Our empirical study requires the implementation of a set of tests and statistical tools. These statistical tests are made by the software of data processing Stata and Winrats.

5.1 Study of Multicollinearity and Specification Tests

5.1.1 Multicollinearity

The detection of a possible existence of multicollinearity is made through a bivariate analysis, from the study of the correlation matrix (Table 2). The analysis of this matrix reveals that all coefficients of correlation of Pearson are lower than the limit traced by Kervin (1992) that is 0.7. We can confirm the absence of a bivariate multicolinearity between the independent variables included in our model of multiple linear regression.

Table 2. Matrix of correlations

	ENDT	INT	TAIL	GART	LIQ	RENT	PROF	RSQ	CROIS	DCOM
ENDT	1									
INT	-0.487	1								
TAIL	0.135	-0.142	1							
GART	0.293	-0.259	0.113	1						
LIQ	-0.004	0.01	-0.014	-0.032	1					
RENT	-0.032	0.015	-0.007	-0.015	-0.39	1				
PROF	-0.297	0.128	-0.096	-0.121	-0.004	0.045	1			
RSQ	-0.007	0.007	0.15	-0.019	-0.002	0.000	0.005	1		
CROIS	0.026	-0.005	0.037	-0.006	-0.003	-0.001	-0.012	0.644	1	
DCOM	-0.338	0.324	-0.13	-0.366	0.028	0.03	-0.073	0.001	-0.004	1

5.1.2 Specification Test

We begin at first by testing the presence of individual effects, essential for our panel data. The probability associated with the F statistic of Fischer is lower than the maximum tolerated threshold (10%). So we confirm the existence of individual effects, which must be taken into account in our model. Then we use the Hausman test (1978) to discriminate between the fixed effects model and the varying effects model, and verify which one is more suitable for the data used. H-statistic of Hausman is associated with zero probability, which implies that the specific effects are correlated with the explanatory variables and the model is for fixed effects. In this case, we use the estimator Within, supposed the best linear unbiased estimator. Finally, we turn to verify the absence of a problem of error autocorrelation. The results of the OLS estimation show that the Durbin Watson statistic is equal to 1.86. This value is close to 2, so we assume the absence of first order autocorrelation. However, given that we are working on data over several years, the Durbin Watson is not sufficient. The test of Breusch-Godfrey allows the detection of on the one hand a possible second order autocorrelation, and on the other a possible presence of an error heteroscedasticity. Based on the decision rule at the 5% level, we assume the absence of error autocorrelation, since the p-value is higher than 5%. We validate that the errors are uncorrelated at the first and the second order confirming the homoscedasticity of the model.

5.2 Estimation Results of All Sectors

The results of the estimation of econometric determinants of the debt ratio are presented in Table 3. The explanatory power of the model seems to be satisfaying. First, the coefficient of determination R^2 shows that 88% of the variation of the debt level is explained by the selected indicators, which implies a very good quality of adjustment. Then, the F statistic is significant at the 1% level. Thus, we consider that the model is statistically significant and explicative of the phenomenon. The Durbin Watson statistic is equal to 1.86, it is close to 2, which allows us to reject the null hypothesis of the Durbin-Watson test, in particular the autocorrelation of errors.

Overall, it appears that the financial structure of SMEs is not neutral, it is dependent on five significant variables including the cost of financing, guarantees, profitability, growth rate and commercial debts.

The coefficient associated with the variable INT is negative and significant at 1% level. Our first hypothesis (H1) is validated, confirming the theory of trade off. The tax advantages favor the debt of the company through the deductibility of interest expenses. The negative correlation is explained by the fact that debt engenders the increase of default risk in addition to risk associated to the small size of SME's, which reduces the tax benefits and therefore reduces the debt. The variable RSQ influences negatively the level of debt but it is non-significant.

The coefficient associated with the variable CROIS is positive and significant at 10% level. This result confirms the hypothesis (H3) of agency theory. Strong growth opportunities encourage managers to engage in risky projects, which increase the agency conflicts between the owner-manager and the bank. The substitution risk induces the

bank to refuse to grant long-term debt. Thus, SMEs are financed massively by current liabilities. Pecking order theory also justifies this relationship (Dufour & Molay, 2010; Adair & Adaskou, 2011). Indeed, in a context of growth, SMEs are characterized by small size and low cash flows; find their internal resources insufficient to finance their investment projects. They therefore resort to bank loans to keep the control of the company. The results relative to the variable GART show a positive and significant impact of tangible assets on bank financing, which validates the hypothesis (H4). According to the agency theory, the rigidity of assets reduces the opportunistic behavior of the owner-manager and thus facilitates obtaining credits (Lopez-Gracia & Sogorb Mira, 2008). Due to the high costs of failure and agency associated with loans to SMEs, creditors require collateral as an obligatory selection criterion for the granting of loans (Adair & Adaskou, 2011).

Table 3. Results of the model estimation

Dependent variable ENDT Panel Regression : Estimation by Fixed effects				
Variable	Coefficient	Std-Error	T-statistic	Probability
INT	-0.4208	0.0195	-21.577	0.0000000 * * *
TAIL	-7.426 E-0.4	9.926 E-0.4	-0.748	0.454 (ns)
GART	0.0839	0.0139	6.036	0.0000000 * * *
LIQ	-8.853 E-0.4	6.485 E-0.4	-1.365	0.172 (ns)
RENT	8.37E-0.5	4.362E-0.4	0.191	0.847 (ns)
PROF	-0.1402	0.0185	-7.5678	0.0000000 * * *
RSQ	2.8494^E-0.3	2.5667^E-0.3	1.1101	0.267 (ns)
CROIS	0.108	0.0593	1.8205	0.0687 *
DCOM	-0.285	0.0205	-13.9253	0.0000000 * * *
Uncentered R^2	0.949	Centered R^2		0.885
Regerssion F	30.2602	Sum of square residuals		22.146
P value (F-statistic)	0.000000000	Std-Error of Estimate		0.0954

Note. *** significant at 1% level; ** significant at 5% level; * significant at 10% level; (ns): not significant.

The impact of the variable RENT is not significant, the hypothesis (H5) cannot be confirmed. The influence of the DCOM on the level of debt is significant at the 1% level. However, the positive impact of commercial debts contradicts the hypothesis (H6) according to which supplier-credits serve as a good signal of solvency of the SMEs towards its commercial partners. This is explained by the role played by the supplier debts as substitutes for bank loans (Petersan & Rajan, 1994; Adair & Adaskou, 2011). According to Delannay and Dietsch (1999), this variable plays a role of financial shock absorber when the borrowers are companies constrained by the lack of liquidity. This is consistent with the situation of small businesses. The variable TAIL is associated with a positive but insignificant coefficient, thereby which invalidates the hypothesis (H7). This observation can be explained by a fairly homogeneous behavior by Tunisian banks towards all SMEs, regardless of their size. This result confirms the findings of Adair and Adaskou (2011) who underline an ambiguous effect of the size on the debt ratio in SMEs.

The estimation results show a negative and significant correlation at the 1% level between bank debt and profitability of the company, which confirms the hypothesis (H8). This variable plays an important role as a determining factor of internal financing capacity of companies. Our results confirm the ideas of the theory of hierarchical financing under which the amount of external resources needed by the company is inversely related to its ability to generate profits. This preference for internal funds is justified by the high costs associated with an informational imbalance between SMEs and lenders. The impact of the LIQ variable is not significant invalidating the existence of a relationship between the debt ratio and liquidity of the company. Hypothesis (H9) is therefore rejected.

Finally, the results confirm the importance of the apparent cost of financing, growth rates, guarantees provided, commercial loans, and funds generated by SMEs in determining the target debt ratio. To refine our analysis, we highlight the importance of the business sector of SMEs in the determination of its bank debt ratio.

5.3 Estimation Results by Business Sector

Several authors such as Jensen et al. (1992), Holmes et al. (1994), Michaelas et al. (1999), Psillaki et al. (2010) and Adair and Adaskou (2011), support the impact of business sector on corporate financial policy. They underline that each sector is characterized by appropriate ways of functioning and constitute a synthetic indicator of the risk bound to the principal activity of the company. In order to detect differences in the debt behavior in SMEs, we will

realize estimations by business sector, by decomposing our sample into industrial SMEs and SME service providers.

Before making estimations by business sector, we must first verify the presence of an effect sector in our sample. The test to be realized is a test of Fisher of equality of the vectors of parameters. Under the null hypothesis, the model is constrained and the parameter vectors are equal for both business sectors. The F-statistic calculated is equal to 71.5. This value is higher than the tabulated value $F_{(9, 602)}$ which is 1.8. Therefore, we reject the null hypothesis, and we conclude that the vectors of parameter are different. The presence of sector effects confirms the interest to estimate separately the two models for the two business sectors. The second test is also a test of Fischer, which identifies whether the model is homogeneous or heterogeneous. We try to determine if the heterogeneity comes from β_i coefficients. Thus, we test the equality of β for all individuals. If we reject the null hypothesis of homogeneity of coefficients β_i, then we reject the panel structure. If, however, we accept the null hypothesis we retain the panel structure and then we try to determine in a second stage, if the constants have an individual dimension. We calculate an F-statistic by the test of Hsiao. The probabilities associated with F-statistic are lower than 10% for industrial SMEs and SME's of services. Therefore, the null hypothesis is accepted. So, we verify the existence of identical coefficients for all individuals and specific constants. Thus, the economic relationship highlighted through this model is supposed to differ for all individuals only through constants included in the model. In the presence of this heterogeneous model, we use the Hausman test, which is used to discriminate between the fixed effects and the random effects. The Hausman statistic is associated with a zero probability for the two business sectors, so we favor the adoption of fixed individual effects. The objective is to identify differences in the financial behavior of the two sectors, we realize thus estimations by Within on the group of industrial SMEs, then on the SME of services (Table 4 and 5).

The results show a good quality of adjustment with a coefficient of determination R^2 of 88% and 89% for the industry and service sector respectively. The P-value of the Fisher test is acceptable, since it has a value lower than 5%. Thus, the regression is significant in general for the both groups of SMEs (Note 4).

The results of the estimation of industrial SME are similar to the results of the first estimation relative to the total sample (Table 4). Estimations lead to an important result whether the significant impact of liquidity on the debt policy. This variable is manifested by a positive and significant coefficient at the 5% level. Therefore, if SMEs has financial liquidities, the access to bank loans will be privileged. This invalidates the hypothesis (H9), which assumes a negative effect of this variable on the debt. However, this positive correlation confirms the predictions of the theory of signal, according to which liquidities present a good signal on the financial situation of the company, which helps to obtain bank loans.

Unlike estimations of SME industry sector, the results of estimations of SME's of services lead to three important conclusions. First, the risk variable appears significant, supporting the negative impact of earnings volatility of SME's services on their debt ratio. This result validates the trade-off theory and confirms the hypothesis (H2). Earnings volatility generated by SME of services increases their risk of failure. The uncertainty associated with cash flow generated leads therefore to refusal of financing by banking institutions. A second particular result in the services sector is the emergence of a non-significant coefficient associated with the variable GART. This is due to the nature of the activities belonging to the sector of services, such as commercial, rents or repairs activities which do not require important tangible assets. Compared to industrial SMEs who are equipped with rigid assets, SMEs of services have less important assets, justifying the absence of impact of tangible assets on the use of bank debt. These two results seem to be related. The volatility of profits generated increases the risk of bankruptcy. With this is added the weak real guarantees offered by the companies, what is translated by a refusal of credit by banks. A third result appears to be important is the absence of impact of the variable growth opportunities on access to financial debt. This finding appears in connection with the previous result on the non-significant impact of assets presented as collateral, given that the growth of assets implies an increase of guarantees. From these two results, we conclude that the ideas of agency theory are not confirmed in SME's service providers.

Table 4. Results of the model estimation (industries)

Dependent variable ENDT Panel Regression: Estimation by Fixed effects				
Variable	Coefficient	Std-Error	T-statistic	Probability
INT	-0.367	0.0248	-14.809	0.0000000 * * *
TAIL	-7.129 e-0.5	1.2206 e-0.3	-0.0584	0.9534 (ns)
GART	0.1575	0.0219	7.1963	0.0000000 * **
LIQ	0.0212	8.4894e-0.4	2.4915	0.0128 * *
RENT	3.297e-0.3	2.6983e-0.3	1.222	0.222 (ns)
PROF	-0.413	0.0339	-12.1808	0.0000000 * * *
RSQ	-8.9332^{E}-0.4	2.5262^{E}-0.3	-0.3536	0.7236 (ns)
CROIS	0.0085	0.0043	1.9658	0.0519 *
DCOM	-0.3982	0.0317	- 12.5774	0.0000000 * * *
Uncentered R^2	0.961	Mean of dependent variable		0.2779
Centered R^2	0.886	Std-Error of dependant variable		0.1997
Regerssion F	30.1351	Sum of square residuals		5.613
P value (F-statistic)	0.000000000	Std-Error of Estimate		0.0754

Note. *** significant at 1% level; ** significant at 5% level; * significant at 10% level; (ns): not significant.

Table 5. Résults of the model estimation (services)

Dependent variable ENDT Panel Regression : Estimation by Fixed effects				
Variable	Coefficient	Std-Error	T-statistic	Probability
INT	-0.454	0.0311	-14.5796	0.0000000 * * *
TAIL	-1.8761 e-0.3	1.5616 e-0.3	-1.201	0.2298 (ns)
GART	-3.734e-0.3	0.0177	-0.2106	0.8332 (ns)
LIQ	-1.1357e-0.3	7.5678e-0.4	-1.5007	0.1336 (ns)
RENT	2e-0.5	5.0279e-0.4	0.0397	0.9682 (ns)
PROF	-0.0628	0.0239	-2.63	0.0086 * * *
RSQ	-6.0844^{E}-0.3	2.2697^{E}-0.3	-2.6807	0.0074 * * *
CROIS	-6.2496e-0.3	5.2623e-0.3	-1.1876	0.2352 (ns)
DCOM	-0.2205	0.0286	- 7.7037	0.0000000 * * *
Uncentered R^2	0.946	Mean of dependent variable		0.2923
Centered R^2	0.8924	Std-Error of dependant variable		0.2933
Regerssion F	32.1221	Sum of square residuals		14.2452
P value (F-statistic)	0.000000000	Std-Error of Estimate		0.1079

Note. *** significant at 1% level; ** significant at 5% level; * significant at 10% level; (ns): not significant.

5.4 Analysis of Results

Interest expenses have a significant impact on the debt ratio, regardless of the studied sample. This finding supports the important role played by this variable in the financing policy of SMEs. Trade Off theory is validated in explaining the structure of SME financing regardless of the activity of the company. In small structures such as SMEs, where the risk of bankruptcy is important, tax advantages are minimal from where a less recourse to the bank debt.

The volatility of corporate earnings has a significant influence only for to the services sector. This implies that SMEs investing in this type of activity are riskier than industrial SMEs. It should be noted that a significant proportion of SMEs in the services sector invest in trading activities, real estate, tourism and communications. They are more exposed to fluctuations of the economic conjuncture than the industrial companies. Especially as, these activities are unstable and face very strong competitions. As a result, banks are vigilant to finance such companies whose generated flows are very volatile.

The positive relationship between growth opportunities and bank debt ratio supported by agency theory is not verified for SME's service providers. Indeed, banks consider that growth opportunities increase the conflicts of interest, and lending to risky firms support further the increase of the risk of asset substitution. Investment in this kind of activities which are difficult to evaluate and to control, give leaders a flexibility that allows them to undertake riskier projects than those as originally announced to creditors. The latter anticipating such behavior, are

unable to estimate the growth rate of these intangible activities by tangible parameters such as total assets. Therefore, banks are based on other criteria, to analyze the financial situation of the company.

The agency theory also supports a positive correlation between the proportion of fixed assets and bank debt. Guarantees present a necessary condition to get a bank loan for industrial SMEs. The latter, investing in tangible activities have a significant amount of tangible assets that serve as relevant indicators to limit the agency conflicts between managers and creditors, and thus favoring the granting of credit.

The profitability of the company is negatively associated with the bank debt for all estimations. This implies that SMEs use external financing only when they exhaust their internal resources, thereby establishing a hierarchical order of financing (Mateev et al., 2013). Besides, the commercial debts affect financing of SMEs without distinction of business sectors. This variable seems to be decisive in determining the structure of bank debt. The negative impact of supplier's debts on bank debt supports that companies rationed by banks increase their commercial debts to face liquidity constraints (Petersen & Rajan, 1994). The liquidity variable is significant only for industrial SMEs. According to signal theory, holding company of surplus of resources favors the granting of bank credits. These liquidities reflect the financial situation and the reliability of industrial SMEs.

The study of financial behavior by business sectors shows some differences related to the investment in a well-defined activity. Banking institutions are based on some tangible parameters in the granting of credit for industrial SMEs, such as guarantees, growth opportunities and liquidity of the company. Due to the high costs of failure and the costs of agency associated with lending to SMEs, offer guarantees as fixed assets is a necessary condition in the access to bank credits. The volatility of earnings generated seems decisive in the sector of services. This business sector is characterized by activities which are difficult to control by banks and more susceptible to the fluctuations of economic conditions. This sensitivity to macroeconomic fluctuations increases the constraints of access to the bank debt and thus favors their rationing on market of bank credits. In spite of the diversity of the activities, some determinants of the debt remain the same for both sub-samples, including financial interests, profitability and commercial debts. These three parameters appear of a major importance in determining the debt ratio SMEs. These companies are characterized by a high risk of failure because of their small and fragile structure, thus they establish a hierarchy in the choice of financing, preferring to be financed first by internal resources. Besides internal funds, commercial debts appear as a full means of financing by substituting bank debts which are difficult to obtain for all SMEs in our sample, and verifying thereby the hypothesis of credit rationing that they suffer from.

6. Conclusion

Our econometric study on a sample of 611 Tunisian SMEs over the period from 2004 to 2009 tried to test the relevance of the predictions of theories intended for large enterprises, applied to the specificities of financing of SMEs. The originality of our work consists in the identification of indicators of the bank debt of Tunisian SMEs, insofar as the majority of previous works are not interested in the Tunisian fabric, and if this is the case, the interest is focused on either listed companies, or on all Tunisian companies regardless of the size and the financial specificities of SMEs.

We tested a set of hypotheses from the various theories that might explain the financial behavior of companies. According to theoretical and empirical works studying the issue of corporate finance, we used the econometrics of panel data to examine the capital structures of SMEs. The estimation results show that bank debt is dependent on some financial determinants which direct the financing policy in SMEs. We specify that our objective was not to compare the adequacy of theoretical prescriptions in large companies to those in SMEs. Our objective is to find a positioning of small businesses in the theoretical framework mentioned. We come to explain the financial structure of SMEs supporting the impact of financial expenses, rigid assets reported as guarantees, growth opportunities, profitability   and supplier credits. The analysis by business sector, does not modify the results in a consequent way, but underlines a bigger fragility of debt in SME's service providers. These companies are more risky, since they are more exposed to changes in economic conditions. Their activities are not easily assessable and controllable by banking institutions. This sensitivity to macroeconomic fluctuations increases the difficulties of access to bank debt and thus promotes their rationing on the credit market. By referring to formulated hypotheses, we deduce that the theory of Trade-Off, agency theory, signal theory and pecking order theory are rather validated in the sector of industries. However, for SME's providers of services, agency and signal hypotheses are not able to explain the financing choices. Despite a diversity of business sector, financial interests, profitability and commercial debts remain crucial determinants of bank debt in SMEs. These three variables interact in the sense of reducing the debt ratio, which highlights the limited use of debt in SME's. As a result, they follow a hierarchy in their financial choice by focusing first on internal funds, the least sensitive to information asymmetry, and then on commercial

debts.

The results of this work are a real contribution to the understanding of financial behavior of Tunisian SMEs, but rest subject to some limitations associated with the constraints imposed in the realization of this study. Further research could refine these results. First, by requesting for example a dynamic model that can take into account a possible endogeneity of the explanatory variables. Such estimation requires a long panel and sophisticated measurement tools. Then, by the consideration of the position of the company in its life cycle.

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Notes

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Note 2. See Article 2of Decree No.2008-388 of 11 February 2008 published in JORT No. 15 of 19 February 2008.

Note 3. Information extracted from the balance sheets of companies do not allow us to measure the costs associated with the debt. Only the financial costs can be determined from the interest paid (Ziane, 2004).

Note 4. The absence of multicollinearity of the explanatory variables and the risk of error autocorrelation is checked for both subsamples.

Note 5. The calculation of the variable INT has sometimes illogical and very high values. Referring to the work of Perez (1998), we limited the results by choosing upper limit of 0.5.

Appendix A. Descriptive statistics of explanatory variables

Variables	Average	Standard deviation	Minimum	Maximum
ENDT	0.2816	0.2514	0	3.94
INT (Note 5)	0.1799	0.1542	0.001*	0.5
CROIS	0.0343	0.1001	-1.2128	0.6688
GART	0.5764	0.4932	0	3.7353
RSQ	0.0997	0.5799	-1.3429	2.9754
RENT	0.0656	4.8659	-155.1802	168.9713
DCOM	0.27	0.2070	0	1.9013
PROF	0.0301	0.1233	-1.7525	3.3120
LIQ	0.19	3.3183	-105.4997	125.6937
TAIL	21.9992	2.5485	6.3386	32.0442

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The Relationship between Applying Methods of Accounting Information Systems and the Production Activities

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Abstract

Accounting information system plays a significant role in enhancing companies environment, thus it is necessary that companies stress on the application of AIS to optimize their business. This study testes the relationship between AIS and production activities (i.e., production design, production planning and control, production operation and cost accounting).This study tests the head of departments' perception towards the relationship between applying accounting information systems and production activities, out of 113 questionnaires distributed, only 69 questionnaires were returned and valid to run the analysis yielded 61% responses rate. The results show a positive significant relationship between AIS and production activities (i.e., production design, production planning and control, production operation and cost accounting).This study recommends that the company have to concentrate on the application of accounting information system to benefit from its merits in all production activities. It will be helpful in future to explore the difficulties that face the Jordanian companies in applying accounting information system in production design.

Keywords: Accounting Information System (AIS), production activities, Jordanian companies

1. Introduction

Accounting information system is one of the basic things that a business must think about. Karthikeyan, (2010) defines accounting information system as the data and information which flow through an information system come from many sources: firstly, business activities with individuals or organizations external to the business, such as sales, purchases, payments of cash, or receipts of cash; secondly, internal business activities, such as placing raw materials in to process, using direct labor, and transfers; thirdly, the feedback resulting from output information and managerial decisions. Without an ample accounting information system, every company would locate themselves in anarchy. The importance of accounting system in organizational policies and models is one of the principal success factors that effectively support the achievement of accounting and financial objectives.

The accounting Information System (AIS) is a computer based system of records, which amalgamate accounting principles and concepts which is used to examine and record business transaction for the purpose to prepare financial statement and provide accounting data to the users. An adequate accounting information system helps to make their accounting activities more easily , quickly and more accurately as accounting records are examined and financial statements are prepared within the system which allows to save time of employees, eschew mistakes and provides information about financial position of the company .Every company can get benefit from an accounting software package. Accounting software helps in improving the way critical financial-related processes are managed across the business which results in increasing the efficiency and smoother execution of core business operations. It can also assist companies in avoiding the risks and severe penalties related with non-compliance with financial reporting laws and guidelines.

The developments in accounting information technologies, together with globalization, have produced such concepts as "new economy", "e-commerce" and "new accounting". These developments have helped in saving time and money and also reduced the costs by accelerating transactions and communication. The developments in information systems have caused all or some of the financial transactions in a business to be carried out in such different forms in electronic environments as electronic commerce and electronic data exchange. So, as a

result, the financial transactions were to be removed from the old-fashioned paper-based activity environment to the electronic environment. Accounting information system is described as the language of a business, and therefore makes change in all processes like, recording, reporting, categorization, and analysis. These changes has also affected some accounting applications i.e., keeping the books, preparing financial statements, tax statements and auditing activities.

These above-mentioned developments and changes in accounting information system, applications and profession inevitable have lead to a change in the demands of the society and the expectations of the members of accounting profession are increasing. The global change in the concept of business administration have forced the members of accounting profession to recognize the economic, social as well as political changes that are being experienced in the world and accumulate knowledge about different cultures, and to be able to look at the events with a global perspective.

Despite the fact that business units have used modern management techniques, which require tremendous change in production methods and machinery, appraisal systems still face severe criticism. In this study, the researchers reviewed related literature on the Accounting Information System in production cycle. Secondly, the Problems of the study are discussed. Then objectives of the study and Research Methodology whichinclude Product Design, Production Planning, Production Operations were analyzed. Then the main hypothesis are formulated which provide statistical information about the sample. Last section discusses the main results and directions for further research are highlighted.

2. Literature Review

The Information provided to managers by Aaccounting Information Systems (AISs) are designed for use in various ways. Researchers in accounting mainly concentrate on three characteristics i.e., focus, assessment and time horizon (IMA, 1995). Focus indicates the extent in which data is internally collected and that this signification refers to organization, for example the rate of productivity in occupations, or external focus on factors, which are significant to environment such as economic conditions. Evaluation and measurement are indicative of financial data including interest margin or non-financial data such as the rate of absenteeism explained under non-financial conditions (Mia, 1993). Time horizon normally reflects historical weekly or monthly data or decisive future of data prediction such as the probability of calculation in a forthcoming project. These characteristics can be explained as the basis for the monarchy of AISs. Usually designed AISs retain relationship with internal financial data along with past time horizon in organization. Therefore, in a smaller monarchy AISs only incorporate internal, financial and historical data. In other words, slight excess in internal, financial and historical data and the vast extent of AISs incorporates external, non-financial and future-centred data. The structure of management accounting system is implemented in different accounting studies (Gul & Chia, 1994; Chong & Chong, 1997; King & Ismail, 2005).

Sera feimidis and Simithon, 2003, stated that how to assess the Accounting information systems by studying the social and organizational dimensions affecting them. To achieve the objectives of the study, the questionnaire was designed and applied to a sample of 160 employees working in information systems departments of participating companies. The most important result of this paper is that there are social and organizational dimensions that must be addressed and the valuation process of these systems were complex and it needs large human efforts of the entity's staff who are familiar with the system and know its secretes and capacities. The study indicates that it is necessary that assessment process is synchronously conducted and planned on a regular basis with the work performance.

Morteza and Rafiei (2011).considered production cycle as the heart of manufacturing firms and has special relationship with all internal sections (units) in which other units have duty to satisfy hardware and software needs of production cycle, in order to optimum application. In doing so they tried to assess the effect of internal factors on optimum application of Production cycle. The study recommended to improve the relation between internal units and production cycle, and it is necessary for the firms to update their Accounting Information Systems based on new technologies.

Deshmukh and Ashutosh(2006) stated in their study that production conversion cycle measures a range of activities such as design of products , planning and controlling of production process and cost accounting. Production planning and control involves planning production by optimizing factors such as customers demand, availability of labor and materials, capacity restriction, distribution limits and storage restriction, are to mention a few. Well-Planned manufacturing activities are carried out by processing raw materials though a combination of machines and humans and generate a finished product. The cost accounting system provides information useful for estimating production function, formatting product costs and generating information for inventory

valuation for external reporting purposes. The twin objectives of quality and cost reduction have been a holy grail for manufacturing industries. The last few decades have observed a number of methodologies, such as material requirements planning (MRP), manufacturing resource planning (MRP II), Just in Time (JIT), Robotics and Six Sigma, which attempted to achieve these objectives. The conversion cycle is most visible in manufacturing organizations; however, the service industry has also benefited from conversion cycle concepts and theories. The conversion cycle interfaces with different functions and departments in the organization, such as purchasing, marketing and finance. Earlier efforts for quality and cost management focused on connecting different departments and streamlining internal operations of organizations.

Al-Hantawi (2001) has specified that the most important characteristics which makes the accounting information systems as effective and efficient, are the accuracy and speed of processing financial data into accounting information, therefore providing management with the necessary accounting information on time; in order to perform functions like planning, control, evaluation, speed and accuracy in retrieving stored overall and descriptive information when it is needed; adequate flexibility; general acceptance of workers; simplicity, and to be associated with other information systems in the entity.

3. Problem of the Study

Accounting information system is essential to any organizations long-run success. The production cycle, revenue cycle, expenditure cycle, human resources cycle, all of these cycles send information about plan production level, inventory level; raw materials needs, labor costs and cost of goods manufactured are sent to general ledger and reporting information system, therefore, the managers at various cycles are in need of certain type of accounting information system. And the question that mention here is how the accounting information system impact on production activities.

4. Objectives of the study

The study aims to identify how the organizations accounting information system can help production activities to achieve its manufacturing goals with the following objectives:

1- To examine the relationship between the application of accounting information system and production activities in product design.

2- To examine the relationship between the application of accounting information system and production activities in production planning and control.

3- To examine the relationship between the application of accounting information system and production activities in production operations.

4- To examine the relationship between the application of accounting information system and production activities in cost accounting.

5. Research Methodology

This study aims to test the head of departments' perception towards the relationship between accounting information system and the production activities, this study used only the head of departments in industrial companies because they are only familiar with aforementioned issues. Questionnaires were sent to head of departments in Al-Hasan Industrial Zone- Irbid, to examine their perception towards the relationship between accounting information system and production activities.

5.1 Hypotheses of the study

This study has four hypotheses were developed to test the relationship between AIS and production activities as follows:

H1: There is a relationship between Accounting Information System and production activities in product design.

H2: There is a relationship between Accounting Information System and production activities in production planning and control.

H3: There is a relationship between Accounting Information System and production activities in production operations.

H4: There is a relationship between Accounting Information System and production activities in cost accounting.

6. Analysis and Findings

After highlighting the issues of this study and develop the hypotheses, in this section, this study exhibits the result of analysis as shown below. Before testing the research hypotheses, it is important that the data collected

were checked for validity and reliability. The content validity of the instrument was ascertained by obtaining expert opinions from six lecturers in Jordanian universities. Additionally, it is necessary to rerun reliability test to check for the reliability of the survey instrument. According to Hair, Money, Samouel, and Page. (2007), the perfect measure of a concept needs more than one item. Moreover, according to Nunnally (1978), to assess the reliability of the survey instrument, the inter-item analysis can be used to test the scale's internal consistency. Hence, Cronbach's alpha is considered an adequate indicator of the internal consistency and the reliability of the survey instrument. The test shows that the Cronbach's alphas range from 0.708 to 0.754, which exceed the minimum value of 0.7 to be acceptable (Sekaran & Bougie, 2010). This means that the instruments used to measure the variable were acceptable and the data were later used for further analyses.

Out of 113 questionnaires distributed, only 72 were returned. Three of these questionnaires were excluded because they were invalid since some of them were incomplete or all answers were marked as "agree". The remaining 69 questionnaires yielded 61% responses rate.

The objectives of the current study are to examine the relationship between the accounting information system and production activities. These relationships are hypothesized as follows.

H1: There is a relationship between Accounting Information System and production activities in product design.

The result of simple regression between AIS and production design shows that the r value is 0.633 (F = 285.354, Sig. < 0.001). This means that AIS is significantly and positively related to the production design, in which for one unit increase in the independent variable (AIS), the dependent variable (production design) will increase by 0.633 (t = 5.984, p = .000). Based on this result, the first hypothesis is supported.

H2: There is a relationship between Accounting Information System and production activities in production planning and control.

The results of a simple regression between AIS and production planning and control shows that the r value is 0.718 (F = 274.632, Sig. < 0.001). This means that AIS has a positive and significant relationship to production planning and control. The test also shows that for each unit increase in the AIS there is an expected increase in the dependent variable by .718 (t = 5.639, p = 0.000), suggesting that AIS predicts significantly the dependent variable. Hence, the second hypothesis is supported.

H3:There is a relationship between Accounting Information System and production activities in production operations

The test shows that the r value is 0.125 (F = 77.182, Sig. < 0.001). This means that AIS has a positive and significant relationship to production operations. The test also shows that for each unit increase in the AIS there is an expected increase in production operations by .125 (t = 16.497, p < 0.01), suggesting that fair value predicts significantly the dependent variable. Hence, the third hypothesis is also supported.

H4: There is a relationship between Accounting Information System and production activities in cost accounting.

The result of simple regression between AIS and production activities in cost accounting shows that the r value is 0.289 (F =10.766, Sig. = 0.045). This means that there is a positive significant relationship between AIS accounting and production activities in cost accounting.. Hence, the fourth hypothesis is supported (Table 1).

Table 1. Simple regression summary

	N	Coefficient	T	p value	R	F value
AIS with PD.	69	0.870	5.984	0.000*	0.633	285.354
AIS with PPC	69	0.911	5.639	0.000*	0.718	274.632
AIS with PO	69	0.277	16.497	0.000*	0.125	77.182
AIS with CA	69	0.502	10.766	0.045**	0.289	3.189

Note. * Significant at 0.01; ** Significant at 0.05.

7. Discussion and Conclusion

The results of current study came in line with the literature that examined the aforementioned relationships. For example Romney and Steinbart (2012) stated that Accounting Information System have a dynamic role in the production cycle. They added that these activities will enable companies to work with the information systems function to ensure that the AIS can provide the information needed to manage the four activities of the production cycle.

Along with uniformity of the status of studied samples based on sample size through simple regression Test, the results show uniformity of studied samples concerning activities of product design and AIS and lack of uniformity in the status of programming activities and production operations. Lack of uniformity in programming activities and production operations indicates that the firms are not prepared to accept a modern costing system which indicates the significance of programming activities and production operations through compatibility of AISs in readiness of firms to accept modern costing systems.

This study recommends that the company have to concentrate on the application of accounting information system to benefit from its merits in all production activities. It will be helpful in future to explore the difficulties that face the Jordanian companies in applying accounting information system in production design.

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Is Underpricing an Appropriate Proxy for Studying IPO Certification?

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Abstract

The dominant technique used to evidence certification effects at IPO is to employ the degree of underpricing as a proxy for certification. We investigate the appropriateness of this proxy in the context of private equity backed IPOs. Our results reveal an incongruence between certification by the vendor and expectations of underpricing. We also find expectations of underpricing are driven by reduced informational asymmetries between the vendor and the vendor's broker rather than between the vendor and the market. Our conclusion is that underpricing is too noisy a variable to be a reliable proxy for certification in this context.

Keywords: certification, IPO, private equity, reputations, private equity added value, underpricing

1. Introduction

Many studies have investigated certification effects at IPO. These have included the certification effects of underwriters (e.g., Carter, Dark, & Singh, 1998; Carter & Manaster, 1990; Logue, 1973; Tiniç, 1988), private equity firms (e.g., Barry, Muscarella, Peavy, & Vetsuypens, 1990; Bradley & Jordan, 2002; Lee & Wahal, 2004; Megginson & Weiss, 1991), auditors (e.g., Beatty & Welch, 1996; Michaely & Shaw, 1995) and lawyers (Beatty & Welch, 1996). Common to many of these studies is the use of the level of underpricing as a proxy variable to assess the presence and magnitude of any certification effect. This practice dominates the study of certification effects attributable to private equity firms and has been applied to studies in the US, Europe, Asia and Australasia (e.g., Barry et al., 1990; Bergström, Nilsson, & Wahlberg, 2006; Bradley & Jordan, 2002; Da Silva Rosa, Velayuthen, & Walter, 2003; Franzke, 2003; Hamao, Packer, & Ritter, 2000; Kraus & Burghof, 2003; Lee & Wahal, 2004; Megginson & Weiss, 1991; Tykvovã & Walz, 2007; Van Der Geest, & Van Frederikslust, 2001).

With such common usage, it is perhaps surprising that the use of underpricing in studying certification effects is not more often questioned or investigated. This paper reports the results of a study which investigated the determinants of certification and the appropriateness of using underpricing as a ubiquitous proxy for certification. The study adopted a market perspective using financial analysts as the unit of analysis.

2. Underpricing as a Proxy for Certification at IPO

Underpricing at IPO is the practice of setting an initial offer price below that which the market is expected to value the stock immediately following the issue (Francis, Hasan, & Hu, 2003; Hunt-McCool, Koh, & Francis, 1996). Underpricing is common and deliberate (Brennan & Franks, 1997; Hunt-McCool et al., 1996) and explanations for it include: (1) to incentivise investors facing risk from informational asymmetries with issuers and investment bankers, especially for smaller, uninformed investors (Baron, 1982; Ibbotson, 1975; Lee, Taylor, & Walter, 1999; Logue, 1973; Rock, 1986), (2) to signal quality (Allen & Faulhaber, 1989), (3) to provide incentives for regular investors to reveal information and intent (Benveniste & Spindt, 1989), (4) the desire to leave positive perceptions of the IPO process and actors with analysts and investors through early capital gains to increase the attractiveness of follow-on issues, that is longer term, mutually beneficial signalling and reputation building functions (Ibbotson, 1975; Jegadeesh, Weinstein, & Welch, 1993; Lerner, 1994; Logue, 1973; Neus & Walz, 2005; Telser, 1980; Welch, 1989), (5) regulation and/or government interference (Ibbotson, 1975; Loughran, Ritter, & Rydqvist, 1994), (6) collusion (Ibbotson, 1975), (7) to encourage over subscription, thereby facilitating choice in share allocations (Brennan & Franks, 1997) and (8) to reduce the likelihood of legal action following poorly performing IPOs (Ibbotson, 1975; Tiniç, 1988).

The degree of underpricing has been theorised as being a signal of the quality of a firm (Allen & Faulhaber, 1989), which is often combined with complementary signalling characteristics, including: (1) the size of offering

(Gale & Stiglitz, 1989), (2) the level of retained ownership (Downes & Heinkel, 1982; Gale & Stiglitz, 1989; Grinblatt & Hwang, 1989; Leland & Pyle, 1977), (3) the value of the firm (Grinblatt & Hwang, 1989) and (4) the quality of underwriters and/or auditors commissioned for the issue (Titman & Trueman, 1986).

Reduced underpricing reduces the differential between the issue price and the immediate post issue market price. Reduced underpricing, therefore, impacts the distribution of realised value between pre and post IPO shareholders (How, Izan, & Monroe, 1995). Numerous empirical studies have identified several factors that are associated with underpricing levels. For example, Logue (1973) and Beatty and Ritter (1986) found that underpricing was lower for larger companies and there is some evidence to support that it is larger for smaller issues (Hanley, 1993; Ritter, 1987), although this finding is not consistent (Tiniç, 1988). Logue (1973) also evidenced that prestigious underwriters were associated with lower underpricing (see also Carter, Dark, & Singh, 1998; Carter & Manaster, 1990; Michaely & Shaw 1995, Tiniç, 1988), Beatty and Ritter (1986) that increased underpricing was associated with greater pre-issue uncertainty, Ritter (1987) that "best effort" issues had greater underpricing than firm commitment issues, Hunt-McCool, Koh & Francis (1996) that underpricing was higher in "hot" issue markets, Loughran, Ritter and Rydqvist (1994) that underpricing was greater the earlier a fixed price is set and Beatty and Welch (1996) that underpricing was positively related to the number of risk factors cited in the issue prospectus and negatively related to the quality of auditors and lawyers. The Beatty and Welch (1996) study also suggested the general economic environment influenced underpricing and that the 1990s had seen a reversal of the 1980s experience of high quality underwriters being associated with lower underpricing.

Early studies, using data from before the 1990s, on venture capital influence suggested venture capital backed IPOs experienced reduced underpricing (Barry et al., 1990; Megginson & Weiss, 1991), although Barry et al. (1990) found reduced underpricing only where "quality" venture capitalists and underwriters were involved in the IPO (see also Carter & Manaster, 1990; Logue, 1973; Spiess & Pettway, 1997 re-underwriter quality). Factors associated with reduced underpricing include the experience of the principal venture capitalist, the lifespan of the venture capital firm and the length of time the principal venture capitalist has spent on the board of the investee company (Barry et al., 1990). More recent studies, based on data from the 1990s, have generated contradictory results. Francis et al. (2003) found venture capital backed IPOs displayed higher underpricing, attributing this to venture capitalists being associated with higher risk ventures. This finding is supported by studies by Brav and Gompers (2003), Bradley and Jordan (2002) and Lee and Wahal (2004). Both the Bradley and Jordan (2002) and Lee and Wahal (2004) studies analysed data from the 1990s which included the "internet bubble" and their aggregate data was heavily influenced by these later years. Nevertheless, Bradley and Jordan (2002) found venture capital backed IPOs to experience higher underpricing in eight of the ten years studied and Lee and Wahal (2004) found only insignificant evidence of reduced underpricing in periods outside the "bubble" years. Bradley and Jordan (2002) concluded that the high underpricing they evidenced for venture capital backed firms was heavily influenced by industry effects, in particular noting the high representation of technology firms among venture capital investments and their incidence of listing on the NASDAQ. Once these effects were controlled for, they found no significant difference between the underpricing of venture capital backed and non-venture capital backed IPOs. This influence of technology bias was further highlighted by Lee and Wahal (2004) who also evidenced a significant association between higher underpricing and the future flow of capital into venture capital funds adding weight to Gompers's (1996) earlier work on grandstanding. The significance of findings of increased underpricing in these more recent studies has been questioned by Dolvin and Pyles (2006) who, following Habib and Ljungqvist's (2001) consideration of wealth loss rather than raw underpricing, demonstrated that venture capitalist involvement resulted in lower wealth losses to pre-IPO owners, providing renewed support for the presence of a certification effect. They also suggested the quality of venture capitalist was a significant factor in reducing the level of money left on the table and this was achieved through enticing entrepreneurs to retain higher levels of ownership, which offset the increased raw underpricing. Reduced underpricing has also been found in respect of reverse LBOs, that is buyouts that return to public ownership having previously been taken private (Cao & Lerner, 2009; DeGeorge & Zeckhauser, 1993; Holthausen & Larcker, 1996; Muscarella & Vetsuypens, 1989).

Several studies have evidenced associations between the quality of venture capitalists, auditors, solicitors and underwriters, making it difficult to attribute any certification benefits to any particular actor (Bradley & Jordan, 2002; Dolvin & Pyles, 2006; Francis et al., 2003; Krishnan et al., 2009; Lee & Wahal, 2004; Morsfield & Tan, 2006; Stein & Bygrave, 1990). Reverse leverage buyouts, similarly, have been found to be associated with more reputable underwriters (Cao & Lerner, 2009). However, it is worthy of note that the key early works of Megginson and Weiss (1991) and Barry et al. (1990) were able to control for underwriter quality. Both found a certification effect for venture capitalists after the control.

The commonly cited certification role posited by Megginson and Weiss (1991) has also been questioned by Habib and Ljunqvist (2001) who, while finding that younger and smaller offerings are riskier and therefore more underpriced in line with Megginson and Weiss (1991), proffered the alternative explanation that this may be because a greater proportion of shares were being sold and therefore greater promotional spend incurred in supporting the sale. The effect of this was to reduce informational asymmetries and consequently the level of underpricing. Their argument was founded on their empirical findings that: (1) underpricing decreases as promotional spend increases, (2) promotional costs increase with the number of shares sold and (3) underpricing decreases with increases in insider selling (see also Bradley & Jordan, 2002).

Evidence of a certification role extends beyond studies based on underpricing. Jain and Kini (1995) posited that markets recognised the added value of venture capital backing and this was reflected in higher valuations for venture capital backed IPOs. Brau and Fawcett (2006), in a survey of Chief Financial Officers, confirmed a certification role for venture capitalists at IPO. Comparisons of the returns on investment achieved by leading venture capitalists also support conclusions of added value and certification at IPO, that is that higher quality venture capitalists and underwriters are associated with higher returns (Lange et al., 2001; Stein & Bygrave, 1990), although in both the Stein and Bygrave (1990) and Lange et al. (2001) studies the definition of leading venture capitalist was based on activity volume rather than metrics related to their previous record of successful IPOs or returns. Accordingly, these higher returns could have emerged simply because these leading venture capitalists were in a position to back the best investments rather than because of any specific value adding activities on the part of the venture capitalists. Additional evidence consistent with the existence of a certification effect are the facts that venture capital backed IPOs have been found to be smaller (by market capitalisation) than non-venture capital backed IPOs (Brav & Gompers, 1997; Francis et al., 2003) and are brought to market earlier (Megginson & Weiss, 1991).

3. Research Model and Questions

The conceptual framework for this study is grounded in theories of resource dependence and exchange (Pfeffer & Salancik, 1978), agency risk (Jensen & Meckling, 1976) and informational asymmetry (Akerlof, 1970), including certification theory (Booth & Smith, 1986).

The model posits three types of resources: network, knowledge and time resources. Network resources derive from the social capital of private equity firms and include their networks and contacts with suppliers, customers and professional advisers including accountants, lawyers, underwriters and industry specialists who can frequently act as consultants or board representatives. The extent and quality of network resources will have a direct influence over a private equity firm's reputation in the market and will influence the performance of the investee company over the course of their relationship depending on the amount of time the private equity firm dedicates to the firm. Knowledge resources derive from the technical, industry and managerial knowledge and experience of the private equity firm and its knowledge and experience of the IPO process. The extent and quality of knowledge resources will have a direct influence over a private equity firm's reputation in the market and will influence the performance of the venture depending on the amount of time the private equity firm dedicates to the investee company. The time resource is, therefore, a critical conduit through which other resources are applied (Balboa & Marti, 2007; Kanniainen & Keuschnigg, 2003; Van Osnabrugge & Robinson, 2001) and the amount and frequency of contact with investees has been shown to be positively associated with measures of performance (e.g., Cumming & Walz, 2009; Gabrielsson & Huse, 2002; Sapienza, 1992; Sapienza & Timmons, 1989).

The key inputs hypothesised as contributing to certification are knowledge, network and time resources. These resources are disparate in nature and detailed information on their application to individual cases is impractical to monitor and convey to the market. The inputs have to be operationalised into variables that can be readily conceptualised by research subjects and on which there is likely to be sufficient information available at the IPO to allow subjects to distinguish between lesser and greater degrees of the variable. Accordingly, the variables are defined around information that can reasonably be expected to be included in the offer prospectus, IPO presentations or obtainable from general market intelligence.

The model outlined in Figure 1 theorises on the application of four factors (independent variables) attributable to private equity backed IPOs that would not be applicable to non-private equity backed IPOs, that is that could contribute to a certification role for private equity firm.
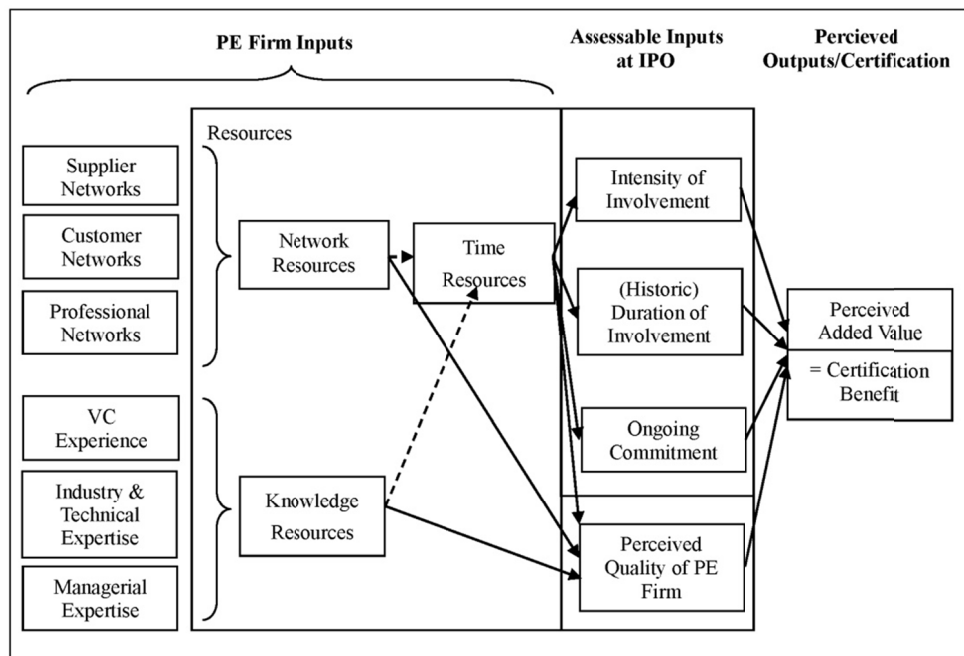
Figure 1. Research model

The four factors hypothesised as influencing private equity firms' certification role are: (1) the intensity of their involvement, (2) the duration of their involvement prior to the IPO, (3) their commitment to ongoing involvement post IPO and (4) the perceived quality of the private equity firm. We then considered how these independent variables impacted two dependent variables, the attractiveness of the IPO and the expected degree of underpricing for the IPO.

Intensity of involvement refers to the density of activities or resource inputs by the private equity firm. In practice, this will predominantly be determined by time commitments in the monitoring, governance and mentoring of the company. It will be reflected in factors such as the number of board members from, or appointed by, the private equity firm, the frequency of financial reporting and the frequency and nature of contact, for example telephone calls versus on-site visits. Higher intensity of involvement represents a larger time and energy commitment to the investee company and, therefore, a higher resource commitment.

Despite Macmillan et al. (1988) early investigations suggesting that venture capitalists' level of intervention did not significantly impact performance, later findings of significant positive impacts now greatly outweigh MacMillan et al's conclusions (e.g., Cumming & Johan, 2007; Gabrielsson & Huse, 2002; Hellmann & Puri, 2002; Sapienza, 1992; Sapienza, Manigart, & Vermier, 1996). Sapienza (1992) found that the most effective venture capitalists were those that maintain frequent and open communications with investee companies, Sapienza and Gupta (1994) that more frequent interactions ensued when the proportion of venture capitalists on the investee company board was higher and Sapienza, Manigart and Vermier (1996) that increased governance was associated with greater added value. Syndication, that is multiple venture capital firms being involved with the same investee company, has been shown to be positively related to venture performance and survival rates (Brander, Amit, & Antweiler, 2002; Hochberg, Ljungqvist, & Lu, 2007). Kanniainen and Keuschnigg (2003) demonstrated that the optimum portfolio size is governed by the level of agency risk in investee companies, that is that time constraints on the venture capitalist are a key determinant of effective governance and mentoring and therefore performance. Further, van Osnabrugge and Robinson (2001) suggested that low numbers of portfolio companies per executive acts as a valued signal of superior selection, monitoring and mentoring to the market. The importance of portfolio size, and therefore, the level of time resource private equity managers can allocate to investee companies, has also been demonstrated by Jääskeläinen, Maula and Seppä (2006), Cumming (2006), Bernile, Cumming and Lyandres (2007), Cumming and Dai (2008), Cumming and Walz (2009) and Meulemen, Amess, Wright and Scholes (2009). Further, the significance of intensity of involvement has been evidenced by Bottazzi, Da Rin and Hellman (2008), who identified a positive relationship between venture capitalist intensity of involvement and their proportion of successful exits (defined as IPO and trade sales). This supported earlier findings by Cumming and Johan (2007) who also evidenced that involvement was positively associated with the

number of board seats held by the venture capital firm and its degree of ownership.

Contributors to private equity firms' intensity of involvement will be: (1) their general disposition to involvement (MacMillan et al., 1988; Sweeting & Wong, 1997), (2) the level of their investment (Cumming & Johan, 2007a; Kaplan & Strömberg, 2004) and (3) the level of previous business experience of individual venture capital partners (Bottazzi et al., 2008). With the levels of investment and board membership highly visible to financial analysts, it is hypothesised they will influence perceptions of intensity of involvement. These arguments, when considered together, suggest that the intensity of involvement will be a significant factor underpinning any certification role at IPO.

Duration of involvement refers to the length of time the private equity firm has had influence into the decision making processes of the investee company through a formal relationship. The longer a private equity firm has been involved with an investee company, the more opportunities it will have faced to influence decisions that could lead to presenting a more attractive proposition to the IPO market (Barry et al., 1990; Dolvin & Pyles, 2006; Lerner, 1994; Sandström & Westerholm, 2003; Timmons & Bygrave, 1986; Wang, Wang, & Lu, 2002). The relationship would likely have involved significant monitoring and information exchange (Gompers, 1995; Sahlman, 1990) and the longer the relationship the more monitoring and resource exchange will have taken place. Potential added value actions over the lifetime of the relationship include strategic and operational planning, management replacement and acting as a consultative sounding board (MacMillan et al., 1988; Sahlman, 1990; Sapienza & Timmons, 1989). Rosenstein et al. (1993) and Sapienza and Amason (1993) have posited that most value is added at the early investment stages. Longer durations of involvement will more likely be associated with involvement at early stages and will therefore have resulted in private equity firms having more opportunities to add value at critical times over the lifetime of the venture. Indeed, Carter and Van Auken (1994) found venture capitalists who prefer to invest in earlier stages of development displayed a higher propensity to exercise control. Similarly, Flynn (2001) found that venture capitalists who were more active in earlier stages and those that had been involved since the venture's early stages had a greater impact on performance. The significance of relationship duration has been evidenced by Barry et al. (1990), who identified an association between reduced underpricing at IPO and the length of time the principal venture capitalist had spent on the board of the investee company, and Cumming and Johan (2010), who found greater added value for longer relationships among Canadian investee companies. These arguments, when considered together, suggest that the historic duration of involvement will be a significant factor underpinning any certification role at IPO.

The level of ownership retained at IPO is commonly cited as a signal of firm quality acting to reduce informational asymmetries through an ongoing commitment to the firm (see Brau & Fawcett, 2006; Downes & Heinkel, 1982; Gale & Stiglitz, 1989; Grinblatt & Hwang, 1989; Leland & Pyle, 1977). Continued involvement by a substantial shareholder also provides continuity and can signal a mitigation of agency risk to new shareholders (Stoughton & Zechner, 1998).

Private equity firms rarely sell all of their holdings at IPO (Barry et al., 1990; Brau & Fawcett, 2006; Brav & Gompers, 1997; Cao & Lerner, 2009; DeGeorge & Zeckhauser, 1993; Holthausen & Larcker, 1996; Mian & Rosenfeld, 1993; Morsfield & Tan, 2006) and their continued involvement has been posited as contributing to the credibility of an offer (Barry et al., 1990; Brau & Fawcett, 2006; Megginson & Weiss, 1991). The degree of ownership has also been found to be associated with the level of value adding services provided by venture capitalists (Kaplan & Strömberg, 2004). This infers higher ongoing ownership levels post IPO will be associated with higher involvement post IPO.

Brav and Gompers (1997), Stein and Bygrave (1990), Lange et al. (2001), Jain (2001), Jain and Kini (1995), Tykvovã and Walz (2007), Rindermann (2003), Bergström et al. (2006), Campbell and Frye (2006; 2009) and Krishnan et al (2009) have all evidenced a direct association between ongoing venture capitalist involvement and superior post IPO long run performance. Further, the proprietorship ratio, agency issues and a stable ownership structure have been shown to be a material influence on analysts' assessments of IPOs (Brennan & Franks, 1997; Field & Sheehan, 2004; Kim, Krinsky, & Lee, 1995; Mear & Firth, 1988; Roosenboom & Van Der Goot, 2005). Thus, the degree of retained ownership, representing ongoing commitment, is likely to be a significant factor underpinning any certification role at IPO.

Private equity firm quality refers to the quality of the firm as perceived by the market which will be based on its reputation in the market. That is, the perceived quality of the firm will be grounded in the level of its reputational capital.

The characteristics of private equity firms that can contribute to perceptions of quality include size, age, extent of networks, structure (e.g., independent/corporate) and market share. Many of these characteristics have been

investigated in terms of their impact on investee company performance as proxies of quality (e.g., Barry et al., 1990; Dolvin & Pyles, 2006; Engel, 2004; Gompers & Lerner, 1998, 2000; Hochberg et al., 2007; Lange et al., 2001; Lerner, 1994; Maula, Autio, & Murray, 2005; Rosenstein et al., 1993). In addition, firm reputations will be influenced by perceived expertise in specific industrial sectors, track records in respect of their own performance and that of their previous IPOs and the reputations of individuals within the firm.

Rosenstein et al. (1993) found that venture capitalists on boards of investee companies were seen as adding no more value than other external directors unless they were from a "top 20" venture capital firm, whereupon their contribution was significantly superior. Similarly, Barry et al. (1990) found reduced underpricing at IPO only where "quality" venture capitalists and underwriters were involved. Dolvin (2005) and Dolvin and Pyles (2006) evidenced that higher quality venture capital firms perform a certification role, materialising through lower issuance costs and Lange et al. (2001) and Stein and Bygrave (1990) that higher quality venture capitalists are associated with higher returns. Similarly, both Campbell and Frye (2009) and Krishnan et al. (2009) found higher quality venture capitalists to be more involved in investee company monitoring post IPO, delivering superior performance. Therefore, the perceived quality of a private equity firm is likely to be a significant factor underpinning any certification role at IPO.

The research model posits a dependent variable of added value as perceived by the market, synonymous with the certification benefit. The perceived added value of private equity firm involvement is founded in historic and anticipated future resource exchange and reductions in informational asymmetry and agency risk. Dependent variables for the study were selected to encapsulate different ways in which perceived added value may manifest into constructs that can be readily understood and informatively assessed by the research subjects. The constructs adopted were those of the general attractiveness of the IPO and expectations on the level of (raw) underpricing.

Assessing and valuing public companies is one of the key roles of financial analysts (Biggs, 1984; Bing, 1971). Venture capitalist involvement is posited as impacting positively on valuations and, therefore, market attractiveness (Jain & Kini, 1995), although there is some disagreement over the extent to which any added value is recognised by the market (Campbell & Frye, 2006; Cohen & Langberg, 2006). Nevertheless, if analysts perceive any added value from private equity firm involvement it will be reflected in their valuation of, and attraction to, a private equity backed IPO. Analysts' IPO valuations entail a highly complex process with numerous objective and subjective input variables. To simplify the cognitive process and facilitate the use of a simple, interval response scale, the first dependent variable was set as the general attractiveness of the IPO proposition (Note 1). The general attractiveness of the IPO under manipulated treatments, ceteris paribus, is therefore an informative dependent variable for determining the relative weights of the hypothesised determinants of certification.

Underpricing is a widely understood construct and a reduction in underpricing is commonly cited as a manifestation of a certification effect (e.g., Barry et al., 1990; Megginson & Weiss, 1991). Accordingly, analysts' expectations of underpricing under manipulated treatments, ceteris paribus, should be an informative dependent variable for determining the relative weights of the hypothesised determinants of certification if underpricing is an appropriate proxy for certification.

The study examined, through an experimental technique, the relative weights of the hypothesised independent variables and their interactions in underpinning private equity firm certification. These are set out as research questions as follows:

The first question relates to the impact of private equity firm involvement on the attractiveness of the IPO.

Q1: What are the relative main and interactive weights of:

- Intensity of private equity firm involvement;
- Duration of private equity firm involvement;
- Commitment to ongoing private equity firm involvement;
- Perceived quality of the private equity firm in underpinning the attractiveness of a private equity backed IPO?

The second question relates to the expected impact of private equity firm involvement on the degree of underpricing at IPO.

Q2: What are the relative main and interactive weights of:

- Intensity of private equity firm involvement;

- Duration of private equity firm involvement;

- Commitment to ongoing private equity firm involvement; and

- Perceived quality of the private equity firm in influencing expectations of underpricing of a private equity backed IPO?

4. Methodology

The research builds on existing theoretical perspectives using a mixed methodology. The use of a mixed methodology is common in business research (Collis & Hussey, 2003) and the combining of qualitative and quantitative techniques delivers considerable complementarities including triangulation, completeness, credibility, enhanced explanatory power and context (Bryman, 2006a, 2006b; Greene, Caracelli, & Graham, 1989; Patton, 1990; Yin, 2003). This research programme combined the quantitative technique of applying experimental treatments with the qualitative technique of semi-structured interviews.

The causal relationship hypothesised in the model was tested through a deductive process using an experimental technique adapted from the early works of Slovic and others (Slovic, 1969; Slovic, Fleissner, & Bauman, 1972). This experimental approach delivers the key benefit of evidencing causality rather than simply a correlational association (Coolican, 2004; Keppel, 1982). Concurrently, interviews were conducted with financial analysts to deliver rich, contextual data on the research questions (Bryman, 1988; Creswell, 1998; Patton, 1990). Data from both elements of the study were integrated at the interpretation phase which enhances the confidence attributable to inferences of causality and the reliability of conclusions (Bryman, 1992; Creswell, 2003; Shadish, Cook, & Campbell, 2002).

The quantitative element of the study adopted a systematic experimental design to present judgement tasks (for reviews see Libby, 1981; Slovic, Fischoff, & Lichtenstein, 1977) in the form of combinations of different levels of the four independent variables. "The most important feature of the experimental method is that it *is* possible to infer a cause-effect relationship" (Keppel, 1982, p. 2 emphasis in original) (see also Coolican, 2004; Holland, 1986; Libby, 1981).

The method has been successfully applied in numerous studies of business decision making such as auditing (e.g., Ashton, 1974; Brown & Solomon, 1990, 1991; Hooper & Trotman, 1996), capital investments (e.g., Wood & Ross, 2006), marketing decision making (e.g., Forlani, 2002) and managerial appointments (e.g., Hitt & Barr, 1989) as well as extensively in studying judgement processes in financial analysis (e.g., Mear & Firth, 1987, 1990; Milne & Chan, 1999; Slovic, 1969; Slovic, Fleissner, & Bauman, 1972; Wright, 1977). Use of the technique is now widely accepted (Keppel, 1982; Trotman, 1996). The within subjects (also known as repeated measures) design employed in this study is commonly used in the decision making literature (Libby, Artman, & Willingham, 1985), is the most commonly used design for the study of learning transfer and practice effects (Keppel, 1982) and is considered effective in analysing problems related to cue usage (Trotman, 1996).

A fully crossed, within subjects design allows for the control of confounding variables as they can be absorbed into the instrument's design (Coolican, 2004; Trotman, 1996). This is because, for each respondent, any confounding variables remain constant across treatments, i.e., subjects act as their own control (Cox & Reid, 2000; Keppel, 1982; Ryan, 2007; Trotman, 1996; Winer, Brown, & Michels, 1991). Consequently, the design delivers high degrees of power, that is the ability to detect differences between treatment conditions when they exist and at very economical response levels (Coolican, 1994; Keppel, 1982).

The experiment was conducted by presenting to subjects all possible combinations arising from a fully crossed, two level, within subjects design testing the influence of four variables, i.e., presenting 16 scenarios (treatments) for assessment. Risks of practice and carryover effects and sensitisation (Keppel, 1982; Rubin, 1974; Slovic, Fischoff, & Lichtenstein, 1977; Trotman, 1996; Winer, Brown, & Michels, 1991) were mitigated by randomising the presentation of the 16 scenarios. Consequently, even if individual practice and carryover effects eventuated, they would not systematically bias results (Keppel, 1982; Trotman, 1996).

The need to develop a richer understanding of the judgemental decision making process requires the adoption of qualitative research techniques. This element of the study collected data through semi-structured interviews to deliver depth of understanding of the motives and actions of individuals who have daily involvement in the assessment and valuation process from their own perspective (Creswell, 1998, 2003; Patton, 1990). A semi-structured approach was adopted to facilitate the uncovering of a richness of data that survey methods and structured interviews do not reveal (Collis & Hussey, 2003; Coolican, 2004; Flick, 2002; Fontana & Frey, 2000). Semi-structured interviews allow the researcher to convey concern for the perspectives of subjects, allow subjects to express emphasis in areas they perceive as most significant and facilitate probing around meanings

and explanations of comments, thereby delivering comprehensive data (Bryman, 1988; Patton, 1990). The use of semi-structured interviews is appropriate for theory informed research, when it is necessary to understand the construct of the situation from the perspective of the subject, when the sequential and causal nature of cues needs to be elucidated and when the respondent needs confidence in the confidentiality of discussions (Collis & Hussey, 2003; Easterby-Smith, Thorpe, & Lowe, 2002; Flick, 2002).

Combining experimental and qualitative methods contributes to the internal and external validity of the study. Internal validity refers to the validity of inferences of whether the observed impact on the dependent variable was actually caused by variations in the independent variable, rather than some other influence (Shadish, Cook, & Campbell, 2002; Trotman, 1996). Within subject experimental treatments have strong internal validity (Collis & Hussey, 2003; Coolican, 2004; Shadish et al., 2002). Analysis of the interview data contributed to considerations of other possible causes and the plausibility of those causes, thereby contributing further to internal validity (Bryman, 1988; Shadish et al., 2002; Trotman, 1996; Yin, 2003). External validity refers to the degree to which conclusions over a cause and effect relationship can be extrapolated to other actors or situations (Coolican, 2004; Shadish, Cook, & Campbell, 2002). The experimental method generally has weak external validity because of the restrictive controls imposed to evidence the cause-effect relationship (Hofstedt & Hughes, 1977; Shadish et al., 2002). The data obtained from qualitative methods often include more representative samples of constructs than experiments and broader sampling thereby enhancing external validity (Shadish et al., 2002). Under the combined design used in this study, the qualitative research contributes to improving this external validity by illustrating the broader applicability of identified relationships (Yin, 2003). The combined use of the two methods contributes further to external validity through the experiment providing statistical generalisability and the interviews analytical generalisability (Shadish et al., 2002; Yin, 2003). Thus, under a combined approach, the experiment delivers internal validity and the qualitative research construct and external validity.

The units of analysis for the study were individual financial analysts. This unit was selected as financial analysts can be considered expert in assessing a firm's value and perform this function as the main role of their daily work (Biggs, 1984). Analysts will be familiar with the assessment of both private equity backed and non-private equity backed companies. Further, they are used to making decisions based on qualitative information (Bouwman, Frishkoff, & Frishkoff, 1987) and, because of their focus on listed companies, their views will not be encumbered by consideration of potential added value under other exit routes, that is their views will be directly relevant to the focus of this study, certification at IPO, without extraneous noise from other possible exit routes. Therefore, they make excellent subjects for experimental treatments on private equity firm certification at IPO. Analysts' views and reports are valued in the marketplace and, through these, they are a material influence in the determination of closing market prices on the day of an IPO's issue (Bouwman, Frishkoff, & Frishkoff, 1987; O'Brien & Bhushan, 1990; Schipper, 1991). Indeed, Schipper (1991) suggested studies of the perceptions and behaviours of analysts can deliver valuable insight into investor behaviour as a whole (see also Trueman, 1994; Welch, 2000). As recommended by Maines (1995), experienced analysts were selected to increase the validity of findings.

Data for the experimental treatments were collected through a personally addressed, self administered survey instrument issued by mail to financial analysts covering Australian equity markets. Mail surveys are posited as presenting few special sampling error problems (Dillman, 1991). The instrument was printed on two sides of A3 paper, folded to provide a four page, A4 sized booklet to allow ample space for a well set out and easy flow of questions (Dillman, 2000; Scott, 1961). The front cover of the booklet carried introductory information highlighting the salience of the subject to respondents (Heberlein & Baumgartner, 1978; Scott, 1961) and instructions. The internal pages carried the experimental scenarios. The back cover collected self reported weights (not reported in this paper) as well as basic demographic data on the respondent. There were four variants of the survey instrument, the only difference in the variants being the order of presentation of scenarios to mitigate practice and carry over effects (Keppel, 1982; Trotman, 1996). The case order for each of the four variants was assigned randomly.

A total of eight interviews with buy-side financial analysts were conducted. Brief profiles of subjects are provided as Appendix I. Five interviewees were based in Sydney and three in Melbourne. All interviews were face-to-face, conducted at the workplaces of interviewees and followed an interview protocol for consistency. Interviews were audio recorded to ensure accurate and unbiased data recording and enhance dialogue flow through improved interviewer attentiveness (Collis & Hussey, 2003; Coolican, 2004; Creswell, 1998; Easterby-Smith et al., 2002; Patton, 1990). Both the survey instrument and protocol were pretested.

5. Findings

5.1 Experiment Findings

A total of 30 completed, usable instruments were returned. 30 completed responses sits at the top end of Coolican's (1994) recommended optimum range (25–30) for studies of homogeneous respondents for repeated measures designs and is ordinarily sufficient to deliver both low Type I and Type II errors.

The analysts cover a wide range of industrial sectors and experience levels, although as a group can be considered experienced with the mean experience level being 12.9 years and the median 11 years. Returns were dominated by buy-side analysts whose experience is mainly with larger IPOs brought to market by private equity companies rather than venture capital firms (Note 2). These results are unsurprising given the natures of the sample selection and local market. The sample was collected from publicly accessible internet sites resulting in the heavy bias in favour of buy-side analysts. Buy-side analysts more directly represent the market than sell-side analysts and so any bias in this direction does not detract from the validity of findings. The size of the Australian IPO market and relative immaturity of the private equity sector (EIU, 2008; Fleming, 2004; Strömberg, 2007) means that most analysts with experience of IPOs will have developed this experience considering offerings emerging from expansion and buyout backgrounds rather than directly from seed and early stage backgrounds, which are commonly associated with smaller technology or biotechnology companies, with an appeal only to specialist fund managers.

In an attempt to generate data on how extensively the independent variables captured the range of significant decision making variables, respondents were asked to score on a Likert scale of 1 (low) to 7 (high) how confident they felt that the variables "encompass the range of VC/PE related characteristics you would consider in assessing an IPO with a VC/PE shareholding". 21 of the 30 respondents (70%) noted their confidence level at the mid point of the scale or higher with a mean of 4.4, median of 5 and mode of 5. This level of confidence indicates the model to be at least moderately strong in capturing the influential factors of private equity firm involvement as perceived by the market. In addition, the finding of large magnitude, statistically significant results with "gold standard" levels of power (Cohen, 1988; Coolican, 2004) for the determinants of attractiveness add further weight to the validity of the model as a robust one for the study of certification effects. Finally, residual plots and Ryan-Joiner (1976) tests suggested the data satisfied the assumption of normality and use of Mauchly's test statistic confirmed the data satisfied the necessary assumption of sphericity (Field, 2005).

An initial MANOVA test proved significant and so the dependent variables were subsequently analysed using individual ANOVA analysis (Coolican, 2004; Field, 2005).

The relative weights of VC/PE related factors in contributing to the attractiveness of an IPO are presented in Table 1.

Table 1. Factor weightings for IPO attractiveness

		Intensity of Involvement	Duration of Involvement	Retained Ownership	Quality	
Magnitude of Effect †						
Rating	High	3.296	3.492	3.75	3.929	
	Low	3.404	3.208	2.95	2.771	
Difference		-0.108	0.284*	0.8*	1.158*	
% of summed absolute differences		4.60%	12.09%	34.04%	49.28%	100%
n=30						
Rank		4	3	2	1	
Effect Size ‡						
Main Effects		0.90%	8.53%	20.81%	37.43%	67.68%
Interactions ‡‡		1.29%	13.29%	8.01%	9.73%	32.32%
Combined Effects		2.20%	21.82%	28.83%	47.15%	100%
n=30						
Rank		4	3	2	1	

Note. * Significant at alpha = 0.05; † The difference in judgement means across treatments (Slovic, 1969); ‡ Effect size is measured by partial eta squared; ‡‡ Interaction effects are assigned to factors weighted by the size of main effect for that factor.

Both the Magnitude of Effect and the Effect Size measures show consistent rank orders and suggest that private equity firm quality dominates other factors. Further, intensity of involvement appears to make a negligible contribution to certification, potentially even having a negative certification effect, although this influence is very small and not statistically significant. The Magnitude of Effect analysis (difference in means between treatments) (Slovic, 1969) shows a significant difference in means for all but the intensity of involvement factor.

The detailed Effect Size analysis (Table 2) shows large and statistically significant (at the 5% level) main effects for the retained ownership and quality factors. The statistical power of both variables is also high, suggesting there is little likelihood of Type II error (Cohen, 1988; Coolican, 2004). The duration factor also shows significance at the 5% level, however, just fails to attain a magnitude sufficient to be classified as large and is classified as moderate (Coolican, 2004). It also shows a reasonably strong power level. As with the Magnitude of Effects analysis, the intensity of involvement factor fails to satisfy standard statistical tests of significance. The interaction between intensity and duration is also statistically significant, is large in its magnitude and has a reasonably strong power level. The finding of moderate or large, statistically significant main effect sizes for three of the four variables plus a large, significant interaction under these controlled conditions further confirms the validity of the model and the existence of a causal relationship between the posited variables and IPO attractiveness.

Table 2. Effect sizes for IPO attractiveness

Factor	Effect Size ‡	p value	Power
Main Effects			
Intensity	0.01	0.531	0.09
Duration	0.13	0.044*	0.53
Retained Ownership	0.32**	0.001*	0.95***
Quality	0.58**	0*	1.00***
Total Main Effects	1.05		
Interactions			
Intensity*Duration	0.17**	0.019*	0.67
Sum of non significant interactions	0.33		
Total Interactions	0.50		
Sum of Effect Sizes	1.55		

Note. * Significant at alpha = 0.05; ** An effect size of 0.14 or above can be considered large (Coolican, 2004); ‡ Effect size is measured by partial eta squared; *** exceeds the 0.8 'gold' standard for power (J. Cohen, 1988; Coolican, 2004).

The statistically significant and large interaction effect between the intensity and duration of involvement variables is worthy of particular note because it reveals that the intensity of involvement, when considered interactively with duration, is a relevant factor and yet when considered in isolation is not. The nature of this relationship warrants further investigation.

The relative weights of private equity related factors in contributing to expectations of underpricing are reported in Table 3.

The two sets of measures are consistent in their ranked order of importance of factors and, as with attractiveness, show the quality of the private equity firm dominating other factors. For expectations of underpricing, the quality of the private equity firm is the only cue that registers a statistically significant difference in means between treatments (Magnitude of Effect) with higher quality private equity firms expected to deliver more highly underpriced IPOs. Likewise, this factor is the only one that demonstrates a large and statistically significant Effect Size (Table 4). There are no significant interactions. A further, notable, result of this analysis is its low sum of Effect Sizes. This poor explanatory power of the model, combined with a lack of statistical significance for the majority of factors, suggests these factors have a limited causal influence on expected underpricing.

Table 3. Factor weightings for expected underpricing

		Intensity of Involvement	Duration of Involvement	Retained Ownership	Quality	
Magnitude of Effect †						
Rating	High	3.456	3.527	3.675	3.796	
	Low	3.558	3.488	3.34	3.219	
Difference		-0.102	0.039	0.335	0.577*	
% of summed absolute differences		9.69%	3.70%	31.81%	54.80%	100%
n=30						
Rank		3	4	2	1	
Effect Size ‡						
Main Effects		1.96%	0.71%	13.19%	24.06%	39.93%
Interactions ‡‡		7.10%	2.65%	26.13%	24.19%	60.07%
Combined Effects		9.06%	3.36%	39.32%	48.25%	100.00%
n=30						
Rank		3	4	2	1	

Note. * Significant at alpha = 0.05; † The difference in judgement means across treatments (Slovic, 1969); ‡ Effect size is measured by partial eta squared; ‡‡ Interaction effects are assigned to factors weighted by the size of main effect for that factor.

Table 4. Effect sizes for expected underpricing

Factor	Effect Size ‡	p value	Power
Main Effects			
Intensity	0.01	0.572	0.09
Duration	0.00	0.752	0.06
Retained Ownership	0.07	0.14	0.31
Quality	0.14**	0.042*	0.54
Total Main Effects	0.22		
Interactions			
Sum of non significant interactions	0.34		
Total Interactions	0.34		
Sum of Effect Sizes	0.56		

Note. * Significant at alpha = 0.05; ** An effect size of 0.14 or above can be considered large (Coolican, 2004); ‡ Effect size is measured by partial eta squared.

5.2 Interview Findings

Private equity firms are considered to be influential over IPO pricing and are perceived to be associated with expectations of lower first day gains (underpricing). Subjects, however, suggested this was attributable to private equity firms being relatively sophisticated investors with the knowledge and skills to negotiate more aggressively with brokers and thereby obtain keener offer prices. This point is illustrated below with several quotes from subjects.

"Of course they want to reduce it [underpricing], they want to take it as far as they can. And will the PE be more sophisticated in avoiding that, absolutely."

Subject A

"They're probably more aggressive on price, yeah. … They're probably more market savvy than just a business that's making ball bearings or something."

Subject F

"You might expect PE, maybe play a bit harder ball and try and get a particular price, maybe that'll limit the upside on day one. I'd guess they might be a little bit more savvy in knowing what the prices will be."

Subject G

"They are probably pricing an IPO opportunity to near perfection."

Subject H

"In the case of a non-PE [backed] company coming to market, in terms of the stock market it is highly likely that the vendor shareholders or the major shareholders and the founders are going to be far less sophisticated in stock market terms than the broker and so where you tend to get underpriced IPOs is from that sphere. PE floats tend to be slightly finer priced because you've got sophisticated folks on both sides of the table."

Subject E

"Lower [first day gain]. because they want the highest price they can possibly get and they want to screw as much out of the institutional buyers as they can."

Subject C

These remarks suggest reduced underpricing arises from reduced informational asymmetry between the vendor and the broker in setting the offer price and not reduced informational asymmetry between the vendor and the purchaser through a certification effect to the market.

6. Discussion

Underpricing plays a major role in the study of IPOs and certification where reduced underpricing is commonly used as a proxy for certification. It has been from the seminal studies of Megginson and Weiss (1991) and Barry et al. (1990) in the early 1990s, and remains so today. In various studies around the world private equity firm involvement has frequently been found to be associated with reduced underpricing. This has been the case in the US, the UK, France, the Netherlands and Japan (Barry et al., 1990; Bergström et al., 2006; Hamao et al., 2000; Megginson & Weiss, 1991; Van Der Geest & Van Frederikslust, 2001). However, it has also been shown to be associated with the perceived quality of the underwriter and auditor (Cao & Lerner, 2009; Carter & Manaster, 1990; Logue, 1973; Michaely & Shaw, 1995; Titman & Trueman, 1986), both of which have also been evidenced as associated with the quality of the private equity firm (Bradley & Jordan, 2002; Dolvin & Pyles, 2006; Francis et al., 2003; Lee & Wahal, 2004; Megginson & Weiss, 1991; Stein & Bygrave, 1990). The degree of underpricing has also been found to be associated with market conditions, company and issue size, promotional activity, the level of retained ownership, the dispersion of shares post IPO, government interference and across different definitions of underpricing (Beatty & Ritter, 1986; Beatty & Welch, 1996; Benveniste & Wilhelm, 1990; Brennan & Franks, 1997; Gale & Stiglitz, 1989; Grinblatt & Hwang, 1989; Habib & Ljungqvist, 2001; Hanley, 1993; Hunt-McCool et al., 1996; Leland & Pyle, 1977; Loughran et al., 1994; Rajan & Servaes, 1997; Ritter, 1987, 1991). With so many justifications proffered for underpricing and significant multicollinearity across them, it is difficult to evidence causality for any. Even in the US context of large data sets, in this noisy environment conclusions on the relationship between private equity firm involvement and reduced underpricing have been inconsistent over time (see Barry et al., 1990; Bradley & Jordan, 2002; Brav & Gompers, 2003; Dolvin & Pyles, 2006; Francis et al., 2003; Lee & Wahal, 2004; Megginson & Weiss, 1991) and causal relationships not evidenced. This study has delivered additional information on this conundrum. A model that has been shown to be reasonably robust in explaining the determinants of certification was relatively poor in explaining expectations of underpricing. It has evidenced, under controlled conditions, an incongruence between the attractiveness of private equity backed IPOs and expectations of their underpricing. Arguably then, reduced underpricing is at best a noisy measure of private equity firm certification and at worst an inappropriate one, particularly so if data limitations preclude the control of key correlated variables such as underwriter quality, issue size, industry sector and promotional spend. The conclusion is that underpricing is too noisy a variable to be appropriately used as a proxy for certification in the Australian market. This is also likely to be the case for other markets with limited data. The application of the research methods used in this study to US subjects would be highly enlightening on the appropriateness of using underpricing as a proxy measure for certification in the US context where data limitations are less restrictive.

7. Conclusions

This research highlights the dangers of following too closely a body of work dominated by correlational studies using large data sets without due consideration of the context to which the method is being applied. With limited data sets it is often difficult to control for highly noisy variables, leading to the use of inappropriate proxy measures and misguided conclusions. The research model adopted in this research appears robust in explaining the determinants of private equity firm certification and yet poor at explaining the determinants of the expected level of underpricing. One of the key strengths of the experimental method is that where an effect exists, the method will pick it up. Consequently, it appears these factors are relevant influences on certification but not on expected underpricing. That is, there is an incongruence between private equity firm certification and underpricing. This is

because the determinants of expected underpricing are more extensive and the noise created by other influences renders the model, as specified, a poor predictor. The conclusion is that reduced underpricing is an inappropriate proxy for assessing a certification effect by private equity firms to the market when other influences on underpricing cannot be controlled for.

Equally important is the correct specification of relationships. The use of underpricing as a proxy for a private equity firm certification effect is further undermined by consideration of where and how informational asymmetry is reduced during private equity backed IPOs. This research suggests that it is the broker that has the dominant influence over pricing and that while lower underpricing is expected for private equity backed IPOs, it is founded in reduced informational asymmetry between private equity firms and brokers, not private equity firms and the market. Reduced underpricing, therefore, is not a reflection of reduced informational asymmetry between private equity firms and the market and should not be used as a proxy for certification in the absence of adequate controls. A more robust proxy of private equity firm certification would reflect the relative weights of reputation, duration of involvement and retained ownership in its operation.

There are several limitations to the study and the application of its findings derived from the target subjects and their sphere of expertise and experience. Firstly, the research was confined to Australian based subjects applying their assessments and comments to Australian experience and market conditions. In particular, the experiences relayed were dominated by exposure to more mature investments, including later stage funding rounds, investments in more mature private companies and previously public companies that had been taken private, that is, experiences mostly excluded experience of early stage investments. Accordingly, the conclusion that underpricing is an inappropriate proxy for certification should only be extended to early stage (venture capital) focused firms following additional confirmatory research. Similarly, research with other subject groups, such as brokers, auditors and solicitors, will add greater understanding of the limitations of using underpricing as a proxy for certification. Finally, the market perspective in the study was represented by buy-side analysts. While this is commonplace and well accepted in academic research (Schipper, 1991; Trueman, 1994; Welch, 2000), it is conceivable that these institutional analysts may display certain biases compared to the market as a whole. For example, their training may render them less susceptible to market fads or to over optimism during hot issue periods. Countering this is that their remuneration structures could lead to pressures to be active during hot issue periods. On balance, and with institutional buyers comprising a large section of the market as a whole, their views can be considered representative of the market, however public perceptions may differ.

This research has introduced a new methodology to the area of understanding private equity backed IPO certification. It is important this direction is pursued in respect of testing the applicability of Australian findings to other markets, in researching the certification effects of other actors in the IPO process and in exploring the underlying dimensions of reputational capital in more depth.

Finally, it is essential that research is instigated to search for and refine a more robust proxy of certification for use in analysing IPOs. This proxy should better reflect the relative weights of reputation, duration of involvement and retained ownership in its operation as these have been shown to be causal determinants of private equity firm certification at IPO.

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Notes

Note 1. The term attractiveness was adopted as an easily understood construct as a result of pretesting the instrument.

Note 2. In the Australian market the term private equity is commonly used to describe later stage and buyout focused firms. Early stage focused firms are commonly referred to as venture capital firms (AVCAL, 2008).

Appendix A

Interviewee Profiles

Subject A was a Senior Investment Analyst specialising in Australian equities with a small to medium sized asset management company who had been in the industry for around six years. His experience of venture capital and private equity backed IPOs was in the valuation of companies mainly coming out of private equity ownership. The size of IPO assessed was ordinarily less than AU$1bn market capitalisation. His experience was not sector specific and included the assessment of IPOs in the mining, data, services and retail sectors.

Subject B was an Equities Analyst with a boutique investment house specialising in Australian equities. He had over 15 years experience in the industry and had worked as both a buy and sell-side analyst. His experience was mainly in the small cap sector.

Subject C was a founding partner of a funds management company. From an accounting, merchant banking and stock broking background, he had spent the last 15 years in funds management dealing mainly with small and medium cap stocks.

Subject D was a Portfolio Manager with an investment management house. He began his career in banking before moving into broking. His background included around 20 years in broking with small and large broking houses with, latterly, a specialisation in the small cap sector. He has been on the buy-side, with a small cap focus, for 5 years.

Subject E was the Managing Director of an investment company specialising in the small listed company sector. He had been in the industry for nearly 30 years and had experience of both buy and sell sides. The last 15 years had been spent in funds management specialising in small cap stocks.

Subject F was an Executive Director of a boutique fund management house specialising in small and medium cap companies. He had worked in the funds management industry for the previous ten years, the last eight specialising in the small cap sector.

Subject G was a Director at a funds management house where he managed a boutique fund focusing on the small cap sector. He had been in funds management for twenty years, the majority of which had been spent specialising in the small cap market.

Subject H was an Industry Analyst with an investment house specialising in the small and medium cap sector. Subject H had been dealing in equity markets for over ten years with experience of both the buy and sell-sides.

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The Unemployment Rate and Labor Force Participation Rate Nexus for Female: Evidence from Turkey

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Abstract

This paper investigates the relationship between unemployment rate and labor force participation rate for urban women in Turkey. By conducting our cointegration analysis on the aggregate and education-specific data, we find that there is a long-run relationship between the two variables for better-educated urban women, but not for total and less-educated urban women. Thus, our analysis reveals no evidence that high unemployment rate is a main driving force behind both the puzzle of low female labor force participation and the under-participation trap. Long-run estimates for better-educated urban women show that a 1% increase in unemployment rate causes an increase in labor force participation rate between of 0.64% and 0.74%. The finding implies that there exists the added-worker effect for better-educated female in urban areas. Furthermore, the results of tests on causality show evidence of both short- and long-run unidirectional causality running from unemployment rate to labor force participation rate, but not vice versa.

Keywords: unemployment, female labor force participation, cointegration, discouraged-worker effect, added-worker effect, under-participation trap, causality

1. Introduction

The responsiveness of the labor force participation to changes in unemployment has been questioned both theoretical and empirical literature during the last decades. In the theoretical literature, there are two hypotheses regarding how labor force responds to fluctuations the degree of labor market slack measured unemployment rate (Note 1). First, the discouraged-worker hypothesis suggests that a large degree of labor market slack, a high unemployment, leads workers to withdraw from labor force. According to this hypothesis, the workers give up the labor force during the periods of a large degree of labor market slack or a high unemployment because of low possibility of finding a satisfactory job and lower potential wages that they face. Thus, this hypothesis implies that there is a negative correlation between unemployment rate and labor force participation rate. Second, the added-worker hypothesis argues that secondary workers will enter the labor force to compensate reductions in family income when unemployment rate increases. With regard to this hypothesis, the secondary workers join the labor force during the periods of high unemployment because the main breadwinner may face a wage cut or lose the job in the periods. Hence, the hypothesis suggests that labor force participation rate increases as unemployment rate rises.

There has been a growing empirical literature that focuses on the relationship between unemployment rate and labor force participation rate within macroeconometrics framework. In the pioneering empirical study, Österholm (2010) adopts Johansen cointegration approach as empirical methodology to examine this linkage for Sweden. The author uses both aggregated and gender-specific data, and reaches the conclusion supporting discouraged-worker effect. Emerson (2011) and Kakinaka and Miyamoto (2012) also study this relationship between the variables within the same methodological framework for United States and Japan, respectively. Like Österholm (2010), using aggregated and gender-disaggregated data, Emerson (2011) finds discouraged-worker effect in the United States. Kakinaka and Miyamoto (2012) differ from the two studies by considering age-specific data as well as aggregated and gender-specific data. They conclude discouraged-worker effect for middle-aged and old male groups, and added-worker effect for young male. Hence, their results imply that fluctuations in unemployment rate differently affect labor force participation decision of different age groups. Apart from the three studies, there are some researches adopting different methodological tools such as a threshold cointegration analysis, an unobserved-components model and panel cointegration analysis. For

example, Congregado, Golpe, and Van Stel (2011) and Fuchs and Weber (2013) employ different time series techniques. Former study examines the two hypotheses by using a threshold cointegration analysis in Spain while later study employs an unobserved-components model to examine the hypotheses for Germany. Furthermore, Filatriau and Reynes (2012) and Özerkek (2013) investigate the linkage between labor force participation and unemployment within panel cointegration framework for OECD and European countries.
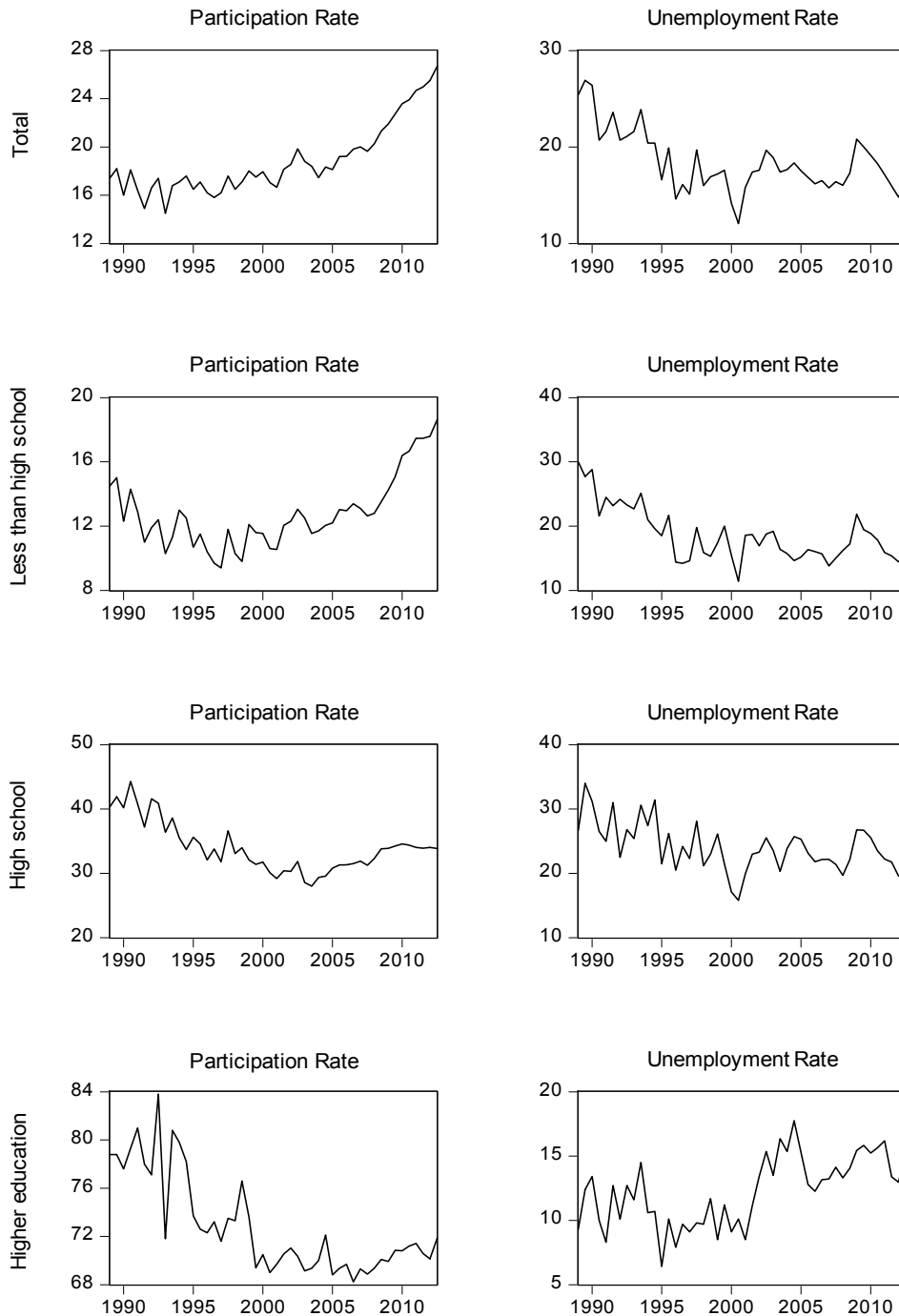

Figure 1. Unemployment and labor force participation rates for female in the urban areas

Severely low and decreasing female labor force participation in urban areas in Turkey is one of the most important problems that Turkish policy makers have faced. The lower labor force participation rates of women have primarily stemmed from considerable low participation rates among less-educated women, which comprise

a substantial part of female labor force in the urban areas. Therefore, the poorly educated urban women are more likely to face an under-participation trap (Note 2). However, participation rates among better-educated urban women are relatively high (See Figure 1). This pattern of female labor force participation in Turkey indicates that there is a strong positive correlation between education level and female labor force participation. Consistent with Turkish female labor force participation data, Tansel (2002) and Kıral and Şengül (2013) find that education has a substantial positive impact on female labor force participation.

The low female labor force participation rates have distorted not only the Turkish labor market efficiency by weakening employment generation capacity, but also growth performance by affecting negatively national saving rate (Note 3). Hence, the question what are the factors that lead to this problem is crucial for policy makers, researchers and labor economists. In previous empirical studies on Turkish female labor force participation rates, the problem have been associated with various factors, including social and cultural factors, early retirement, childcare, migration, civil status, education, wage levels and business cycle (Note 4). However, there are very little empirical studies on the relationship between unemployment rate and female labor force participation rates (Note 5). This paper aims to fulfill this gap in light of the main literature presented above. We focus mainly on whether the puzzle of low female labor force participation in the urban areas stems from the discouraged-worker effect triggered high unemployment rate. We consider education-specific data as well as aggregated data as the literature indicates that the link between unemployment rate and labor force participation rate may be different for women with different levels of education. Disaggregating by education level also enables us to examine whether the under-participation trap is associated with high unemployment rate.

The remainder of this paper is organized as follows. Section 2 delineates the data and discusses the empirical analysis and findings, and section 3 concludes the paper.

2. Data and Empirical Analysis

We employ semi-annual data on unemployment (u_t) and labor force participation (p_t) for urban women, whose ages are 15 and over. Aside from the aggregate data, we also use education-specific data (Note 6) to analyze the impact of education level on the relationship between u_t and p_t. Thus, we divide female into two groups: less-educated female and better-educated female. The first group includes female with less than a high school education and a high school education while the second group includes female with a higher education. The variables come from Turkish Statistical Institutes (TUIK) and cover the period 1989:S1-2012:S2 (Note 7). Figure 1 shows time series plot of the variables.

2.1 Unit Root Tests

Although the main literature generally adopts a system-based cointegration test, we use a single equation cointegration test (Autoregressive Distributed Lag (ARDL) bounds testing approach) to examine whether there exist cointegration as our sample size is small. The ARDL bounds testing approach does not necessitate pretesting the variables to determine their order of integration. However, to identify robustness of our results, the orders of integration of variables are determined by using two conventional unit root tests: Augmented Dickey-Fuller and Phillips-Perron tests. Table 1 presents the results from the unit root tests. The two unit root tests confirm that the variables are non-stationary, but their first differences are stationary.

Table 1. Unit root tests

| | Total | | Less-Educated Female | | | | Better-Educated Female | |
| | | | Less than a High School | | High School | | Higher Education | |
Test Stat.	p_t	u_t	p_t	u_t	p_t	u_t	p_t	u_t
ADF stat.	1.55 (2)	1.67 (1)	2.61 (0)	2.63 (0)	2.10 (1)	2.14 (3)	2.53 (0)	1.65 (2)
PP stat.	2.30 (2)	2.37 (1)	2.52 (1)	2.63 (0)	2.17 (2)	3.43** (3)	2.21 (2)	2.68 (2)
	Δp_t	Δu_t	Δp_t	Δu_t	Δp_t	Δu_t	Δp_t	Δu_t
ADF stat.	7.62*(1)	5.37*(2)	8.90* (0)	5.70* (0)	10.96* (0)	6.23* (2)	10.87* (0)	4.80* (2)
PP stat.	10.79*(1)	10.67*(2)	8.90* (0)	11.9* (2)	9.92* (1)	22.11* (2)	9.82* (1)	10.70* (2)

Note. ADF and PP test equations include deterministic term (constant). Figures in parenthesis are lag lengths selected by AIC. ADF and PP critical values at 1% and 5%, respectively, are 3.70, 2.92 and 3.57, 2.92. *, ** denote statistical significance at 1% and 5%, respectively.

2.2 Cointegration

To implement the bounds test, we estimate the following unrestricted error correction model (UECM).

$$\Delta p_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{k} b_{1i} \Delta p_{t-i} + \sum_{i=0}^{k} b_{2i} \Delta u_{t-i} + b_3 p_{t-1} + b_4 u_{t-1} + \varepsilon_t \qquad (1)$$

The ARDL method of cointegration analysis includes two-step procedures. First step entails determining lag length of the unrestricted error correction model and testing null hypothesis of no-cointegration H_0: $b_3 = b_4 = 0$ by F test. Peseran, Shin and Smith (2001) report two sets of critical values (CVs) for the F test with and without time trend. Nonetheless, the critical values are not suitable for a small sample size because they are generated from a large sample size. Therefore, we consider critical values documented by Narayan (2005) for small sample size. Comparing the calculated F statistic with the respective critical values can be made decision on cointegration among the variables. If the F statistic is higher than upper bound critical value, there exists a long-run relationship. Second step requires determining lag length of ARDL model and estimating long-run coefficients, respectively.

Table 2. Statistics for selecting lag length in bounds tests equation with constant and trend

Total						
p	AIC	SBC	$\chi_{SC}^{(1)}$	p-val	$\chi_{SC}^{(2)}$	p-val
1	2.941	**3.138**	5.802	0.016	7.909	0.019
2	2.900	3.178	0.076	0.781	5.566	0.061
Less than a High School Education						
p	AIC	SBC	$\chi_{SC}^{(1)}$	p-val	$\chi_{SC}^{(2)}$	p-val
1	2.860	**3.057**	3.038	0.081	6.867	0.032
2	2.874	3.153	0.903	0.341	9.445	0.008
High School Education						
p	AIC	SBC	$\chi_{SC}^{(1)}$	p-val	$\chi_{SC}^{(2)}$	p-val
1	4.264	4.461	8.096	0.004	14.104	0.0009
2	4.100	**4.378**	0.030	0.861	7.298	0.026
Higher Education						
p	AIC	SBC	$\chi_{SC}^{(1)}$	p-val	$\chi_{SC}^{(2)}$	p-val
1	4.700	**4.897**	4.673	0.030	8.787	0.012
2	4.654	4.932	0.303	0.581	1.304	0.520

The long-run relationship between labor force participation and unemployment is analyzed by the bounds testing approach. First, we select lag length of the UECM by considering Schwarz Bayesian Criterion (SBC). The SBC shows that optimal lag lengths are one for total and female with a higher education and less than a high school education and two for female with a high school education (See Table 2). Second, we test null of no-cointegration by employing F test. Table 3 presents two crucial findings: (i) there is no cointegration between labor force participation and unemployment for total female (ii) there is a long-run relationship between two variables for better-educated female, but not less-educated female. Thus, the cointegration analysis suggests that the under-participation trap, which is a serious problem for poorly educated urban women, is not due to high unemployment rate (Note 8).

Table 3. Bounds test for cointegration

		Calculated F-statistics [lag]	Critical value bounds of the F statistics (T=50)			
			Lower Bound I(0)		Upper Bound I(1)	
			1%	5%	1%	5%
Total		4.11 [1]				
Female Education Level						
Less Educated	Less than a high school	7.54 [1]	9.89	6.98	10.96	7.86
	High school	3.20 [2]				
Better Educated	Higher education	**9.52****[1]				

Notes. Cointegrating equation includes constant and deterministic trend. Lower and upper bound critical values for bounds test are derived from Narayan (2005:p1990), Case V: unrestricted intercept and unrestricted trend (k=1).

2.3 Long-Run Estimates

Since cointegration analysis shows that there is only long-run relationship between labor force participation rate and unemployment for better-educated female, we estimate following ARDL model for female with a higher education.

$$p_t = \beta_0 + \beta_1 t + \sum_{i=1}^{n} \beta_3 p_{t-i} + \sum_{i=0}^{m} \beta_4 u_{t-i} + \varepsilon_t \tag{2}$$

Table 4 reports the results from ARDL (2, 0) selected by SBC as well as DOLS and FMOLS to analyze whether the results are robust. The table clearly shows that the estimates of β from the techniques are statistically significant and similar. The estimates reveal unemployment rate has a positive impact on labor force participation. Therefore, we argue that our results can be interpreted as favoring added-worker effect.

Table 4. Long-run estimates

Education Level	Techniques	β(s.e)	L_C [prob]	SubF [prob]	MeanF[prob]
	ARDL	0.74 (0.44)	-	-	-
Higher Education	DOLS	0.64 (0.32)	-	-	-
	FMOLS	0.64 (025)	1.14[0.010]	11.38 [>0.20]	8.95[0.010]

Notes. Long-run model consists of deterministic terms (constant and trend). Estimated cointegrating relationship is only given the table, omitting the deterministic terms. DOLS estimate is based on one lead and one lag of first differences. To obtain FMOLS estimate, covariance parameters are estimated by employing a Parzen kernel on residuals pre-whitened with a VAR (1) and bandwidth parameter is automatically selected.

To examine parameter stability of the estimated model, we employ both Hansen stability test (Note 9) based on FMOLS estimation reported in Table 4 and CUSUM and CUSUMSQ tests (Note 10) based on ARDL (2,0) estimation shown Figures 2 and 3. All tests reveal the model parameters are stable.
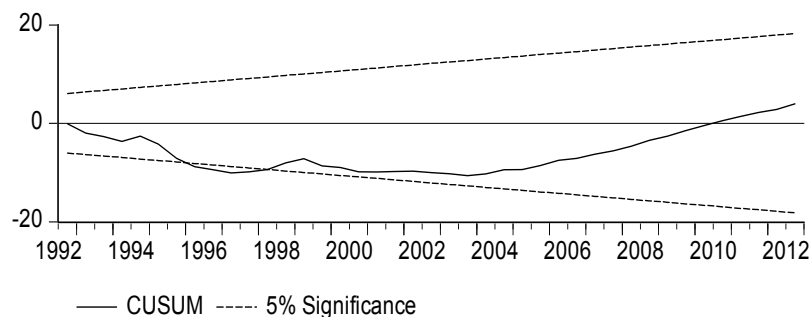
Figure 2. CUSUM test for ARDL (2,0)
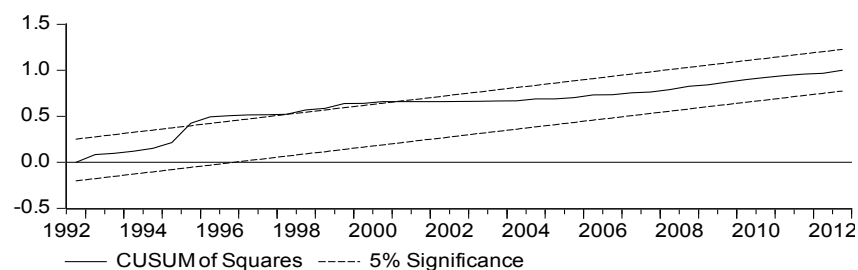
Figure 3. CUSUMSQ test for ARDL (2,0)

Both the results of the cointegration test and the long-run estimates clearly show no evidence of the discouraged-worker effects for urban women in Turkey. This implies that high unemployment rate is not a main driving force behind the very low and declining female labor force participation. Furthermore, our analysis

conducted on the education-specific data reveals two important findings. First, the under-participation trap does not emanate from high unemployment rate. Second, there is an added-worker effect for better-educated urban women in Turkey.

2.4 Causality

Finally, we examine the causal link between unemployment and labor force participation. To identify the direction of causality between the variables, we employ a Granger causality test. We estimate following error correction models (ECMs) with one lag to implement the test,

$$\Delta p_t = \alpha_{p0} + \alpha_{p1}\hat{\varepsilon}_{t-1} + \alpha_{p2}\Delta p_{t-1} + \alpha_{p3}\Delta u_{t-1} + \varepsilon_{pt}$$
$$\Delta u_t = \alpha_{u0} + \alpha_{u1}\hat{\varepsilon}_{t-1} + \alpha_{u2}\Delta p_{t-1} + \alpha_{u3}\Delta u_{t-1} + \varepsilon_{ut}$$

(3)

where $\hat{\varepsilon}_{t-1}$ is the error correction term derived from ARDL (2,0) model and ε_{pt} and ε_{ut} are serially uncorrelated error terms.

The significance of t-statistic related to coefficients of the error correction term, α_{p1} and α_{u1}, implies the long-run causality. The significance of F-statistic on coefficients of first difference of variables, α_{p3} and α_{u2}, also implies the short-run causality between variables of interest. Table 5 presents the results of Granger causality test. The results reveal that there exists a unidirectional short- and long-run causality between unemployment rate and labor force participation rate, which runs from the former to the later.

Table 5. Causality

Dependent Variables	Direction of Causality		
	Short-run Causality		Long-run
	Δp	Δu	$\hat{\varepsilon}_{t-1}$ (t-st.)
	F-st.		(t-statistic)
Δp	-	3.81**	-0.51 (3.18)*
Δu	0.71	-	0.013(0.093)

Note. *, ** denote statistical significance at 1% and 5% levels, respectively.

3. Conclusion

In this paper, we explore the linkage between unemployment rate and labor force participation rate for female in the urban areas in Turkey using semiannual time series data for period 1989:S1 to 2012:S2. The existence of a long-run relationship between the two variables is investigated employing ARDL bounds test technique. With the aggregate rates of unemployment and labor force participation, cointegration analysis finds that there is no long-run relationship between unemployment and labor force participation rates for urban women. Thus, the analysis suggests that the puzzle of the low female labor force participation rates is not associated with high unemployment rate. Results based on education-specific data also show that there exists a cointegration relationship between unemployment rate and labor force participation rate for better-educated female but not for less-educated female. This finding implies that there is no evidence that the under-participation trap relates with high unemployment rate. To obtain long-run estimate of the impact of unemployment rate on labor force participation rate for better-educated female, we use ARDL, FMOLS and DOLS techniques. The techniques confirm that unemployment rate has a statistically significant positive effect on labor force participation rate. Dependent on the result, we argue that there exists added-worker effect for better-educated female. We also analyze the casual link between unemployment rate and labor force participation rate and find that there are short- and long-run causality from the former to the later, but not vice versa. Overall, we find no evidence of the discouraged-worker effect for urban women in Turkey.

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Notes

Note 1. See Lundeberg (1985), Borjas (2005), Isserman, Taylor, Gerking and Schubert (1987).

Note 2. See Booth and Coles (2007) for the under-participation hypothesis.

Note 3. See Taymaz (2012) and IMF (2012).

Note 4. See World Bank (2009) for a survey about the empirical literature.

Note 5. There are only two papers examining this linkage in the literature. Başlevent and Onaran (2003) have examined this relationship for married women using a bivariate probit model. Their results have indicated that added-worker effect prevails the discouraged worker effect. In contrast, Tansel (2002) have suggested that

unemployment rate has a sizeable discouraging effect on female labor force participation.

Note 6. The empirical literature clearly shows that different age groups react differently to fluctuations in unemployment rate (see for example: Kakinata & Miyamato, 2012; Filatriau & Reynes, 2012; Fuchs & Weber, 2013). Therefore, we also want to employ age-specific data to shed further light on the issue. However, we do not access the age-disaggregated female labor force data.

Note 7. Data set depends on the Household Labor Force Survey. Female labor force data in the survey are measured semi annul until 2000, quarterly for period of 2000 to 2005 and monthly since 2005. To analyze longer period, we transform quarterly and monthly data into semiannual data.

Note 8. Taymaz (2012) emphasizes that the main sources of the under-participation trap are the large share of informal sector and low access higher education. In the World Bank (2009), it is also stressed that the under-participation trap comes from the social and economic barriers that the less-educated female face.

Note 9. See Hansen (2002) for detail.

Note 10. CUSUM and CUSUMSQ procedures are depend on the cumulative recursive sum of recursive residuals and the cumulative sum of squares of recursive residuals, respectively. The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the breaks points. If the statistics stay within at 5% critical bounds, then the model is stable.

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Macroeconomic Determinants of Commodity Returns in Financialized Markets

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Abstract

Financialization of commodity markets has been a broadly discussed topic in recent years. However, its implications for commodity investors have not yet been fully explored. This paper concentrates on the macroeconomic determinants of commodity returns in financialized and non-financialized markets and on their role for a tactical asset allocation. The study aims to contribute to the academic literature in four ways. First, it provides fresh evidence on the interdependences between commodity returns, inflation and the business activity. Second, it documents increased correlation of the commodity returns with the business activity in the financialized markets. Third, it explores changes in the lead/lag relationship of commodity prices and the business cycle. Fourth, it proves that the commodities retained their inflation hedging abilities in the financialized markets. The computations are based on listings of various commodity indices between 1970 and 2013.

Keywords: commodities, inflation hedging, macroeconomic determinants, business cycle, financialization

1. Introduction

Commodities as an asset class have made a huge career in recent years. Commodity markets are no longer mainly meeting points for refineries, mines and lone traders. They became a popular playground not only for highly-specialized hedge funds, but also for ETF's, retirement funds and traditional investors. Commodities are now a common asset class in investment portfolios.

The above-described changes are clearly visible, when one looks at the investors structure. Cheng and Xiong (2014) indicate, that according to an estimate provided by the CFTC in 2008, investment inflows to commodity indices from early 2000 to June 30, 2008 amounted about 200 billion $ (CFTC, 2008). The CFTC in its statistics divides market participants into commercial, who are basically hedgers, and non-commercial, who are speculators. For example, in the crude oil market, the participation of traders reported as non-commercial grew from as low as 2–6% in the beginning of the '90 to 32–38% in 2012. In the case of cotton market the increase was from about 1% to over 30%. The changes for other commodity markets were quite similar.

The described process has been named "financialization", according to the term coined by Domanski and Heath (2007), and it has become an area of interest for many research papers (Irwin & Sanders, 2011; Irwin & Sanders, 2012; Tang & Xiong, 2012; Vdovenko, 2013). The crucial question is: how the structural changes affected the way market works? Does the soaring investors' presence impact the price formation process? Can it cause bubbles? Does it alter the way the commodity prices behave? Two opposite views have crystalized as a result of the debate. On the one hand, some economists (Krugman, 2008; Stoll & Whale, 2010; Irwin & Sanders, 2010; Irwin & Sanders, 2012; Fattouh et al., 2012) argue, that speculators do business as usual and should not be a cause for concern. Additionally, the evidence for the systematic impact of commodity investors is rather scarce and unconvincing. On the other hand, supporters of the "bubble" hypothesis suppose, that the "commodity financialization" is important for the price formation (Masters, 2008). A noticeable number of studies provides interesting theoretical and empirical evidence. The apparent impact may take a few forms, for instance by inducing bubble formation (Masters, 2008; Gilbert, 2009; Gilbert, 2010; Einloth, 2009), influencing the term-structure of commodities and thus the roll-yields (Mayer, 2010; Tang & Xiong, 2012; Vdovenko, 2013, Brunetti & Reiffen, 2011; Zaremba, 2014a), impacting correlations across distinct commodities and correlations of commodities with a different asset class (Silvennoinen & Thorp, 2009; Tang & Xiong, 2012; Zaremba, 2014b).

With regard to this paper, the last issue is of particular importance.

How does the increased presence of commodity investors distort the correlations? The basic mechanism may look as follows. Let's take an investor, who holds a constant portion of his investment portfolio (for example 10%) allocated to long-only position in commodity futures and the rest of the portfolio in more traditional asset classes, like stock or bonds. If the stock prices fall, and the commodity prices remain constant, then the fraction of portfolio invested in commodities increases. So as to rebalance the portfolio, the investor has to reduce (or just short) the commodities. Due to this process, the external shocks from the equity market are transferred into the commodity markets.

There are a few reasons why investors include commodities in their portfolios. First, diversified commodity portfolios tend to provide long-term positive risk premiums and equity-like returns (Till, 2007a; Till, 2007b; Till, 2007c; Erb & Harvey, 2006; Gorton & Rouvenhorst, 2006). Second, commodity returns are not fully correlated with traditional asset classes, so they may be effectively used in a strategic asset allocation in order to expand the existing mean-variance frontier (Ankrim & Hensel, 1993; Becker & Finnerty, 1994; Kaplan & Lummer, 1998; Anson, 1999; Abanomey & Mathur, 2001; Georgiev, 2001; Gorton & Rouwenhorst, 2006). Third, some commodities may provide a hedge against the tail risk (Deaton & Laroque, 1992; Armstead & Venkatraman, 2007). Fourth, commodity indices reveal some inflation-hedging properties (Umar & Spierdijk, 2011). Fifth, a range of studies documents, that commodities may be also employed for a tactical asset allocation (Erb & Harvey, 2006; Adams et al., 2008).

There seems to be a broad consensus among the economists, that there are plenty of benefits of commodity investing. However, how these benefits are affected by the financialization, is still an open question. Some papers indicate that the changes in the term structure and correlations could have casted some doubt on the validity of the inclusion of commodities in the strategic asset allocation (Zaremba, 2014a, 2014b). The aim of this paper is to focus on the two other traits: the inflation hedging abilities and the tactical asset allocation across the business cycle.

The paper concentrates on the macroeconomic determinants of commodity returns and how the interrelations between commodities and economic aggregates changed since the market became "financialized". It targets to contribute to the economic literature in four ways. First, it provides the fresh evidence on the interndepences between commodity returns, inflation and the business activity. Second, it tests whether the dependence of commodity prices on the business activity became stronger in recent years. Third, it is examined whether the lead/lag relation of commodity prices with regard to the business cycle have changed. Fourth, it investigates if the commodities retained their inflation hedging abilities.

The paper is composed of three main sections. First, it presents the theoretical basis for the research. Second, it introduces the research methods employed and data sources. Third, it discusses research results. The papers end with conclusions and indications for further research.

2. Theoretical Basis

There is an extensive financial literature exploring macroeconomic determinants of commodity returns. However, two issues seem to be particularly extensively discussed: the behaviour of commodities during the business cycle and their inflation hedging properties. What is especially interesting, in both cases the behaviour of commodities is very different to equities or bonds.

With regard to the business cycle, a widely-held belief says, that the main difference is that the equities and bonds are anticipatory in their pricing, while the valuation of commodities relies more on the current economic conditions (Anson, 2009, p. 332). The value of equities and bonds stems from the assessment of future financial conditions of their issuers. The better off the companies are expected to be, the higher long-term cash flows and coupon payments they generate. As a result, the prices of these assets should be the highest when the future prospects of the economy are the best, not the current conditions. In other words, their performance should be superior to other classes when the expected (not actual) economic conditions improve. However, commodities reflect the opposite pattern. The demand for raw materials from the real economy is the biggest, when the economic activity is the highest. Consequently, the commodity prices should be determined not by the future economic conditions, but by the current state of the business cycle. The prices ought to be the lowest when the economic activity is the lowest, and the highest when the economic activity is the highest.

It is important to note, that both asset classes are generally positively correlated with the business cycle, however the correlation is derived from different channels. In case of equities the relationships come from the changes in financial shapes of the companies, time-varying discount rates, wealth effects, the variation in costs of financing

etc. In case of commodities, what matters to greater extent, is rather the current economic demand. As a result, although there may be some differences in the lead-lag interdependencies, the both asset classes are generally positively correlated with the business cycle.

The above-mentioned theory is consistent with empirical observations. Adams et al. (2008) indicates that commodities are characterised by positive correlations and betas with the changes in the industrial production. The relationship is particularly strong for industrial metals and energy commodities. Gorton and Rouvenhorst (2006) and Nguyen and Sercu (2010) examine returns to commodities and other asset classes during various stages of a business cycle. They document, that commodities usually perform the best in a late stage of an economic expansion, while equities in an early stage. Some papers even indicate that the decent performance of commodities may last even to the first months or quarters when the economic growth is slowing (Anson, 2008; Gorton & Rouvenhorst, 2006). In other words, while the commodities comove with the economic activity, or even lag it slightly, the equities tend to lead a business cycle by a few months (Siegel, 1991; Backus et al., 2007).

There is a popular view in economy, that value of traditionally denominated assets, like stocks and bonds decreases, when unexpected or realized inflation increases. The reason for this lies inherently in the nature of these instruments. On the one hand, the bondholders obtain a predefined stream of cash flows, and its present value, besides the size and timing, depends on interest rates, which commonly rise in line with inflation. On the other hand, stocks often represent residual claims on fixed assets and their value usually comoves with the inflation. Nonetheless, the major part of stocks' value comes from future cash flows not related directly to these assets, and companies often operate under nominally fixed contracts on both the sales-side (contracts with customers) and the cost-side (suppliers, employees, etc.). Additionally, free cash flows to shareholders, although highly uncertain, are still discounted with inflation-determined cost of capital. Contrary to stocks and bonds, the nature of commodities with regard to inflation is very different. In fact, the behaviour of commodity futures interact with inflation in a few ways. The changes in commodity prices impact inflation, as they constitute a component of a basket of goods based on which inflation is calculated (Cheung, 2009). This impact may be direct or indirect, for instance an increase in oil prices influences transportation costs which eventually impacts the costs of transported goods. Moreover, the prices of actively traded commodity futures contract reflects expected inflation and adjust to the most up-to-date economic information (Adams, Füss, & Kaiser, 2008).

The theoretical deliberations on the role of commodities in inflation hedging are backed up with firm evidence. Early studies on inflation hedging properties of commodities include papers by Greer (1978) and Bodie and Rosansky (1980), who investigated responses of bonds, stocks and commodities to changes in inflation between 1950 and 1976. They found that, the annual excess returns of stocks and bonds are negatively correlated with the variation in inflation (correlation coefficient equal -0.48 and -0.2), while the correlation with commodities is positive (0.52). Numerous later studies confirmed these findings using more sophisticated techniques and extended samples (Becker & Finnerty, 1997; Gay & Manaster, 1982; Ankrim & Hensel, 1993; Froot, 1995; Kaplan & Lummer, 1998; Gorton & Rouwenhorst, 2006; Kat & Oomen, 2007; Hoevenaars et al., 2008; Spierdijk & Umar, 2013). The correlation tends to be particularly strong in case of unexpected inflation (Gorton & Rouwenhorst, 2006; Ankrim & Hensel, 1993) and over long horizons (Gorton & Rouwenhorst, 2006; Roache & Attie, 2009). A significant number of papers explored the hedging properties among particular subsectors of commodities or even single commodities (Erb & Harvey, 2006; Kat & Oomen, 2007; Woodard, 2008). Generally, it appears, that the correlation with inflation is especially high for energy resources and industrial metals and lower for agriculture and precious metals (Adams, Füss, & Kaiser, 2008).

What is interesting, as the most of commodities included in popular index are quoted in US dollars, the inflation hedging ability of commodities seems to be to some extend mainly a dollar phenomenon. Many papers suggest, that although the correlation of commodity returns with the US inflation is strong and significant, the relationship with for example the European or Japanese inflation remains rather unclear (Adams, Füss, & Kaiser, 2008). However, the evidence from some other less developed markets, such as India, confirms the inflation hedging properties (Joshi, 2012).

The above-described patters of commodities' price behaviour were mainly examined and evaluated in the pre-financialization period. The question, whether the structural changes denoted as financialization—influenced these patterns remains open. In this paper, we test three hypotheses about the structural changes of commodities' behaviour in the financialized markets with regard to macroeconomic determinants of commodities returns.

First, as the commodities became more correlated with equities, their interdependence with the business cycle could have strengthened. The reasoning behind this is that in non-financialized markets interrelation channels have different and uncorrelated timing, while in financialized markets both effects are to greater extent

synchronized, so they may amplify each other. As a result, the question is, if the interdependence between commodities' prices and business activity is stronger in the financialized markets than in the non-financialized markets.

Second, as the equities and commodities became more correlated and changes in their prices more synchronized, it seems plausible, that traditional lead-lag patters could also be distorted. The question is, do the commodities in financialized markets still lag or coincide the business activity, or alternatively do they behave in more equity-like, anticipatory way.

Third, do commodities still constitute a decent inflation hedge? Although, there appears to be no aspect of commodity markets' finacialization, which would directly impact the interrelation with the economy-wide inflation, the influence may be indirect, for example through distortions in the interrelations with the business activity. In short, here the question is, has do the commodities retain their inflation hedging properties both in financialized and non-financialized markets.

3. Data Sources and Research Methods

So as to test the robustness of the research results, a few types of data and computational approaches are used. Generally, computations are based on S&P-GSCI Commodity Index, which is probably the most popular and broadly used gauge of commodity markets, however the computations are also repeated with JP Morgan Commodity Curve Index and Dow Jones-UBS Commodity Index. Total return indexes are employed as they represent the investors point of view the best, additionally the results with S&P-GSCI spot return and excess return indices are confirmed. Moreover, I the S&P-GSCI subindices related to subsectors of commodity markets are investigated: industrial metals, energy resources, agricultural and precious metals (S&P-GSCI Industrial Metals, S&P-GSCI Energy, S&P-GSCI Agriculture, S&P-GSCI Precious Metals).

The point of view of US investor is taken into account, as this is the biggest financial market used by many foreign investors, so the results are comparable with other papers in the field. As a result, the US nominal Industrial Production Index and the US Consumer Price Index as representations of business activity and price inflation are used.

The calculations are performed on the basis of annual and quarterly changes of economic aggregates or commodity prices. However, in order to avoid unnecessary loss of information monthly time series of log-returns or log-changes ("nepers") are used and employ the Newey-West (1997) correction for formal statistical interferences. All the regressions are estimated using OLS and are tested in a parametric way.

All the computations are performed on the full sample, encompassing period 31/12/1970 to 30/11/2013. The particular lengths of various time series may vary due to data availability and this issue is presented in details in the appendix 1. What is more, the sample is split into two subsamples: the pre-financialization period (31/12/1970–31/12/2003) and the financialization period (31/01/2004–30/11/2013). The border date is chosen to some extent arbitrally, but generally it was in 2004 when the widely cited paper by Gorton and Rouvenhorst (2006) initially appeared and when the huge influx of investors' money to the commodity markets began.

Investigating the interdependence with the business cycle, the focus is on two issues particularly: on the magnitude of the relationship and its lead/lag character. First, the average returns are computed during the phases of industrial production growth and contraction (growth rate greater or smaller than 0 in an examined period). This approach is also taken by for example Fama and Schwert (1977), Schwert (1981) or Bekaert and Wang (2010). Second, simple linear correlation coefficients are calculated between changes in commodity prices and industrial output. Finally, commodities "economic betas" are found by regressing commodity returns on the variation in industrial production. This approach is consistent with for instance analysis of Adams et al. (2008), however the currency component is dropped as the currency effects are beyond the scope of this paper. The following formula is used:

$$r_t = \mu + \beta p_t + \varepsilon_t \tag{1}$$

where: r_t is the commodities' return computed as

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

p_t^n is the change in industrial output computed as

$$p_t = \ln\left(\frac{IP_t}{IP_{t-1}}\right) \tag{3}$$

P_t is the commodities' price level at time t, and IP_t is the size of industrial production.

Finally, the lead/lag relationship of commodities is tested with regard to the business cycle. It is performed by computing time-series correlations with various lags and leads ranging from -10 to +10 months and observing in which lead/lag configurations the correlations are the strongest.

Investigating the issue of inflation hedging requires somehow similar research instruments. the inflation hedging properties of commodities are tested using a few methods. First, the Bodie's approach (Bodie, 1982) is used, which makes use of Pearson's linear correlation coefficients, denoted ρ. Bodie shows that employing a mix of risky and nominally riskless assets, if ρ = 1, then it is possible to form a riskless real return by taking long position in the risky asset. However, if ρ is equal to 0, then the examined asset has no inflation hedging ability.

It is important to note, that in this analysis takes the point of view of an investor who is only interested in protecting the expected returns from inflation and this is assumed that the dynamics between the asset returns and inflation rates may be fully captured by a simple static regression. Investors' specific mean-variance preferences are not considered, therefor there is no advantage taken of other measures of inflation hedging capabilities, like for example hedging demand (Campbell & Viceira, 2001; Schotman & Schweize, 2000), inflation tracking portfolios (Lamont, 2001; Bekaert & Wang, 2010) or real return variance (Reilly et al., 1970; Cagan, 1970; Bodie, 1976). Additionally, Umar and Spierdijk (2011) discuss various inflation hedge measures and indicate that some of them, like Fisher-based measures and Schotman and Schweizer approach, generally yield consistent results. Additionally, it is also possible to hedge with an asset which is negatively correlated to price inflation, provided that it is possible to short the asset. Summing up, the higher the absolute value of correlation, the better the hedging properties. This measure is relatively intuitive, as the correlation reveals the strength of the relation between changes of assets' values. Finally, it is important to note that the correlation with expected, unexpected and realized inflation is tested.

Second, the measures related to Fisher's hypothesis (Fisher, 1930) are employed, which basically state that:

$$E\left(r_t^n\right) = E\left(r_t^r\right) + E\left(i_t\right) \tag{4}$$

where: r_t^n is the asset's nominal return computed as

$$r_t^n = \ln\left(\frac{P_t}{P_{t-1}}\right) \tag{5}$$

i_t^n is the inflation rate computed as

$$i_t^n = \ln\left(\frac{I_t}{I_{t-1}}\right) \tag{6}$$

r_t^r is the corresponding asset's real return, P_t is the assets price at time t, and I_t is the level of a chosen price index. In other words, Fisher assumes, that the asset expected returns and expected move in parrarel, as the lost of value due to inflation need to be offset by the increase in expected nominal returns. Umar and Spierdijk (2011) indicate, that there is a broadly accepted belief in the academic literature, that if the Fisher's hypothesis holds, then an asset is a good hedge against the inflation. Fama and Schwert (1977) show how this approach may be employed to test the inflation hedging properties. In this paper, the hedging properties taking into account both expected and unexpected inflation is examined, so the following formula is used (consistent with Fama & Schwert, 1977):

$$r_t^n = \mu + \beta E\left(i_t\right) + \gamma\left[i_t - E\left(i_t\right)\right] + \varepsilon_t \tag{7}$$

where μ, β and γ are model parameters and ε_t is the zero-mean disturbance term. If $0<\beta<1$, than the asset is a partial hedge against expected inflation and if $\beta>1$ than it is more than a complete hedge. The β coefficient equal to 0 denotes no hedging abilities against expected inflation and $\beta<0$ mean than the asset is a perverse hedge. The interpretation of γ analogical, however it relates to unexpected changes in inflation. One of the main weaknesses of the approach above is that the expected inflation is actually unobservable. Two distinct proxies for this are used. The short-term expected inflation (3 months) is represented by corresponding period's T-bill rate (this simple approach is commonly used, for example by Fama & Schwert, 1977; Schwert, 1981; Gorton & Rouverhorst, 2006), and the long term inflation (1 year) is represented by the University of Michigan Survey of Inflation Expectations 1 year ahead. Additionally, the nominal returns against the realized (ex-post inflation) are regressed, which is consistent with the approaches of Jaffe and Mandelker (1976) and Boudoukh and Richardson (1993):

$$r_t^n = \mu + \beta i_t + \varepsilon_t \tag{8}$$

The β coefficient in equation (4) can be interpreted in the same way as the β coefficient in formula (3), however it obviously is not equal to it.

4. Results and Discussion

In the results section the initial focus is on the correlation with the business activity and next on the inflation hedging properties. The table 1 exhibits average returns during periods of US industrial production growth and contraction.

Table 1. Commodity returns during economic periods of economic growth and contraction

Panel A. Quarterly data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
				Full period					
Growth	3,17	1,92	2,11	3,45	1,56	3,12	1,45	2,63	1,78
Contraction	-0,99	-2,54	-2,32	-3,27	-1,02	-2,52	2,28	-1,91	-1,64
Difference	4,16	4,46	4,42	6,73	2,58	5,65	-0,83	4,54	3,42
				Pre-fin					
Growth	3,57	2,06	1,68	4,07	1,90	3,02	1,04	2,49	2,21
Contraction	0,18	-1,70	-2,50	-1,57	-0,54	-2,24	1,99	-1,64	-0,72
Difference	3,39	3,76	4,18	5,64	2,44	5,26	-0,95	4,13	2,92
				Post-fin					
Growth	1,90	1,47	3,50	2,14	0,47	3,39	2,65	2,81	1,21
Contraction	-5,23	-12,20	-8,59	-16,79	-2,30	-0,66	-0,25	-4,42	-7,97
Difference	7,13	13,67	12,09	18,93	2,77	4,05	2,89	7,24	9,19

Panel B. Annual data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
				Full period					
Growth	11,28	6,37	6,80	10,36	6,33	12,19	7,19	9,75	7,41
Contraction	-0,68	-7,72	-5,68	-6,37	-4,11	-10,85	4,45	-9,28	-12,39
Difference	11,96	14,09	12,48	16,73	10,44	23,04	2,74	19,04	19,80
				Pre-fin					
Growth	12,19	6,26	4,18	11,20	7,15	9,96	5,00	6,99	7,26
Contraction	6,56	-1,86	-3,37	11,90	-1,31	-4,72	2,72	-1,84	-1,45
Difference	5,63	8,12	7,56	-0,71	8,46	14,68	2,28	8,83	8,71
				Post-fin					
Growth	8,40	6,70	15,11	8,62	3,71	17,79	13,41	13,39	7,61
Contraction	-30,01	-26,53	-12,34	-40,93	-7,37	-4,78	1,18	-19,51	-22,25
Difference	38,41	33,23	27,45	49,55	11,08	22,57	12,24	32,90	29,86

Description: The table depicts log-returns to commodity indices during periods of growth of the US industrial production. All the data are in %. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Discription: Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970–12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The panel A refers to quarterly time-series and the panel B to annual time-series.

The computations confirm that the economic conditions seem to be an important determinant of commodity returns. The increases in aggregate commodity prices were much higher than contraction during periods of economic growth, which usually coincided with falls in commodity prices. This observation is true no matter what commodity index (JPMCCI, DJUBS or GSCI) or what computational convention (TR, SR, ER) is used. However, when it comes to sectorial indices, the precious metals seem to be an only exceptions, as their prices usually soared more during economic contractions than expansions. Finally, the investigation of commodities behaviour during post- and pre-financialization period provides some additional insights. In the financialized markets the differences in average returns between growth and recession periods were much higher than in

non-financialized markets.

The analysis of commodity-industrial production correlations allows to reach similar conclusions (Table 2).

Table 2. Correlation between commodity returns and changes in industrial production

Panel A. Quarterly data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	0,28	0,28	0,26	0,27	0,20	0,24	-0,02	0,38	0,36
	(3,73)	(3,81)	(3,44)	(3,10)	(2,63)	(2,96)	(-0,19)	(3,90)	(3,62)
Pre-fin	0,21	0,22	0,23	0,16	0,18	0,14	-0,03	0,32	0,22
	(2,39)	(2,57)	(2,67)	(1,45)	(2,06)	(1,45)	(-0,38)	(2,45)	(1,54)
Post-fin	0,41	0,41	0,35	0,39	0,23	0,41	0,08	0,41	0,41
	(2,74)	(2,74)	(2,30)	(2,61)	(1,47)	(2,76)	(0,47)	(2,75)	(2,73)
Difference	0,20	0,19	0,12	0,23	0,06	0,27	0,11	0,09	0,19
	(2,10)	(2,08)	(1,66)	(1,91)	(0,97)	(2,13)	(0,49)	(1,69)	(1,77)

Panel B. Annual data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	0,33	0,35	0,32	0,35	0,21	0,33	-0,04	0,50	0,51
	(2,97)	(3,14)	(2,86)	(2,85)	(1,81)	(2,82)	(-0,30)	(4,12)	(4,16)
Pre-fin	0,12	0,16	0,20	0,03	0,12	0,18	-0,07	0,22	0,14
	(0,67)	(0,91)	(1,10)	(0,14)	(0,67)	(0,87)	(-0,37)	(0,73)	(0,41)
Post-fin	0,70	0,70	0,65	0,67	0,46	0,58	0,18	0,67	0,68
	(5,97)	(6,00)	(5,27)	(5,47)	(3,11)	(4,37)	(1,13)	(5,53)	(5,68)
Difference	0,58	0,54	0,46	0,64	0,33	0,41	0,25	0,45	0,55
	(3,49)	(3,49)	(3,10)	(2,75)	(1,90)	(2,42)	(0,83)	(2,23)	(2,21)

Description: The table depicts correlation coefficients between log-returns to commodity indices and logarithmic changes of industrial production in the USA. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970-12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The panel A refers to quarterly time-series and the panel B to annual time-series. The first row in each case refers to correlation coefficients and the numbers in brackets denote statistical significances.

Generally, with the exception of precious metals, the correlations with changes in industrial production were positive. The interdependence is the highest for energy and industrial metals and the weakest for agriculture (except precious metals, naturally). Again, it is important to note, that the correlation in the post-2003 period was much higher than in the earlier years. For example, in the case of S&P-GSCI TR quarterly changes it increased twice, from 0.21 to 0.41, and for annual data it soared from 0.12 to 0.7. The differences were commonly statistically significant. The above-described observations are confirmed by the economic beta analysis' results (Table 3). The betas clearly increased, no matter what index, return convention or data frequency are used. Actually, the betas in the pre-financialization period were not statistically different from zero. Summing up, the observations are consistent with the first supposition of this paper.

Table 3. Economic betas of commodity indices

Panel A. Quarterly data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	1,83	1,87	1,63	3,43	1,34	2,01	-0,10	2,40	2,09
	(3,75)	(3,83)	(3,46)	(3,13)	(2,64)	(2,98)	(-0,20)	(3,94)	(3,66)
Pre-fin	1,22	1,31	1,31	2,38	1,18	1,17	-0,25	1,85	1,25

	(2,42)	*(2,60)*	*(2,70)*	*(1,48)*	*(2,08)*	*(1,47)*	*(-0,38)*	*(2,51)*	*(1,59)*
Post-fin	3,51	3,50	2,88	4,20	1,70	3,57	0,41	2,79	2,43
	(2,79)	*(2,79)*	*(2,34)*	*(2,66)*	*(1,50)*	*(2,81)*	*(0,48)*	*(2,79)*	*(2,78)*

Panel B. Annual data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	1,65	1,72	1,38	2,98	1,14	2,27	-0,18	2,29	2,16
	(2,32)	*(2,45)*	*(2,23)*	*(2,06)*	*(1,41)*	*(2,12)*	*(-0,23)*	*(2,78)*	*(2,77)*
Pre-fin	0,56	0,75	0,77	0,35	0,70	1,28	-0,40	1,04	0,68
	(0,70)	*(0,95)*	*(1,15)*	*(0,15)*	*(0,70)*	*(0,92)*	*(-0,39)*	*(0,83)*	*(0,47)*
Post-fin	3,94	3,93	3,26	4,67	2,04	3,75	0,58	3,12	2,79
	(3,06)	*(3,08)*	*(2,71)*	*(2,81)*	*(1,60)*	*(2,24)*	*(0,58)*	*(2,84)*	*(2,91)*

Description: The table exhibits commodities' economic betas computed as regression coefficients of commodity indices' log-returns against logarithmic changes of industrial production in the USA. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970-11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970–12/31/2003 and the post-fin period is 12/31/2003-11/30/2013. All the data comes from Bloomberg. The panel A refers to quarterly time-series and the panel B to annual time-series. The first row in each case refers to regression coefficients and the numbers in brackets denote statistical significances. The regression parameters are estimated using OLS and tested in a parametric way.

The Tables 4 and 5 present the correlation of changes in industrial production with returns to commodity markets with various leads and lags.

Table 4. Commodities and economy–lead/lag correlations (quarterly data)

	Pre-fin				*Post-fin*		
Lead/lag	GSCI	JPMCCI	DJUBS	Lead/lag	GSCI	JPMCCI	DJUBS
-8	-0,12	-0,15	-0,09	-8	-0,09	-0,04	0,01
-7	-0,18	-0,19	-0,07	-7	-0,02	0,01	0,06
-6	-0,19	-0,22	-0,06	-6	0,10	0,13	0,19
-5	-0,16	-0,20	-0,05	-5	0,26	0,28	0,34
-4	-0,09	-0,15	-0,03	-4	0,38	0,40	0,45
-3	0,00	-0,06	0,02	-3	0,46	0,46	0,48
-2	0,10	0,08	0,09	-2	0,45	0,44	0,45
-1	0,18	0,24	0,18	-1	0,43	0,42	0,42
0	0,21	0,32	0,22	0	0,41	0,41	0,41
1	0,18	0,33	0,22	1	0,44	0,43	0,42
2	0,11	0,25	0,15	2	0,40	0,37	0,35
3	0,04	0,18	0,09	3	0,32	0,28	0,25
4	0,01	0,10	0,02	4	0,20	0,17	0,15
5	0,02	0,10	0,02	5	0,18	0,15	0,15
6	0,05	0,11	0,05	6	0,15	0,12	0,10
7	0,06	0,10	0,03	7	0,14	0,11	0,09
8	0,07	0,03	-0,02	8	0,05	0,04	0,01
Lead/lag of max corr.	0	1	1	Lead/lag of max corr.	-3	-3	-3

Description: The table exhibits correlations between commodity quarterly log- returns and quarterly logarithmic changes in US industrial production with leads and lags ranging from -8 to +8. GSCI TR, JPMCCI and DJUBS refer to S&P-GSCI Commodity TR Index, JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970-12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The panel A refers to quarterly time-series and the panel B to annual time-series. The first refers to leads and lags in commodities' time series. The final row indicates the lead or lag with the maximum correlation coefficient.

The observations are consistent with the second supposition of this paper, that the relationship with the business cycle could have changed from coinciding or lagging to anticipatory. First, reading the quarterly data (table 4), in the pre-2004 period, the changes in commodity indices generally coincided or gently lagged the business activity. However, since 2004, the commodities seem to be a rather leading indicator, as the changes in business activity are mostly correlated with the changes in commodity prices 3 months earlier. The examination of annual returns (Table 5) reveals a slightly different picture. The commodities seem to be a lagging indicator, and changes in their prices follow the changes in industrial production. The lag varies from 7 months (GSCI) to 1 month (DJUBS). After 2004 the lag shrank to 1 month (GSCI, JPMCCI)–0 months (DJUBS). It appears that the lead/lag behaviour of commodity indices was truly different in the last ten years than in the preceding 30 years.

Table 5. Commodities and economy–lead/lag correlations (annual data)

	Pre-fin				*Post-fin*		
Lead/lag	GSCI	JPMCCI	DJUBS	Lead/lag	GSCI	JPMCCI	DJUBS
-8	0,00	0,00	0,00	-8	0,03	0,12	0,18
-7	0,00	0,00	0,00	-7	0,14	0,22	0,28
-6	-0,11	-0,12	-0,08	-6	0,27	0,33	0,39
-5	-0,08	-0,06	-0,04	-5	0,39	0,43	0,49
-4	-0,03	0,01	0,01	-4	0,49	0,52	0,57
-3	0,01	0,08	0,05	-3	0,58	0,59	0,63
-2	0,05	0,14	0,09	-2	0,64	0,64	0,67
-1	0,09	0,19	0,12	-1	0,68	0,66	0,68
0	0,12	0,22	0,14	0	0,70	0,67	0,68
1	0,15	0,25	0,15	1	0,71	0,68	0,68
2	0,16	0,27	0,14	2	0,69	0,65	0,64
3	0,17	0,25	0,11	3	0,66	0,61	0,59
4	0,18	0,23	0,08	4	0,60	0,56	0,54
5	0,19	0,21	0,05	5	0,55	0,51	0,48
6	0,20	0,18	0,01	6	0,49	0,45	0,40
7	0,20	0,13	-0,03	7	0,42	0,38	0,33
8	0,20	0,07	-0,07	8	0,34	0,31	0,24
Lead/lag of max corr.	7	2	1	Lead/lag of max corr.	1	1	0

Description: The table exhibits correlations between commodity annal log- returns and annual logarithmic changes in US industrial production with leads and lags ranging from -8 to +8. GSCI TR, JPMCCI and DJUBS refer to S&P-GSCI Commodity TR Index, JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970–12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The first refers to leads and lags in commodities' time series. The final row indicates the lead or lag with the maximum correlation coefficient.

The examination of inflation hedging properties generally confirms earlier papers in the field. Investigating the commodities' inflation correlation coefficients (Tables 6 and 7), it can be seen, that the composite commodities indices' returns are clearly correlated with commodity returns. Nonetheless, this observation refers only to realized and unexpected inflation, while the expected component reveals no significant correlation. When it comes to sectorial subindices, the correlation is particularly strong in the cases of energy resources. Finally, it seems that the correlation significantly increased during the post-2003 period. It is true for all composite indices and energy, but not for industrial or precious metals and agriculture.

Table 6. Correlation between inflation and commodity returns (quarterly data)

Panel A. Realized inflation

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	0,33	0,29	0,26	0,55	0,19	0,17	0,14	0,61	0,56
	(4,59)	(3,92)	(3,47)	(7,20)	(2,58)	(2,01)	(1,78)	(7,39)	(6,26)
Pre-fin	0,16	0,12	0,13	0,40	0,19	0,02	0,17	0,40	0,38
	(1,89)	(1,35)	(1,51)	(3,96)	(2,14)	(0,20)	(1,85)	(3,19)	(2,89)
Post-fin	0,71	0,71	0,69	0,72	0,19	0,51	0,15	0,68	0,61
	(6,17)	(6,07)	(5,72)	(6,30)	(1,18)	(3,57)	(0,95)	(5,70)	(4,68)
Difference	0,55	0,59	0,55	0,31	0,00	0,49	-0,01	0,28	0,22
	(4,71)	(4,66)	(4,43)	(4,38)	(0,66)	(2,90)	(0,48)	(3,70)	(3,00)

Panel B. Expected inflation

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	0,05	-0,03	-0,08	0,10	0,03	-0,02	-0,09	0,05	0,08
	(0,61)	(-0,37)	(-0,99)	(1,12)	(0,36)	(-0,29)	(-1,12)	(0,43)	(0,74)
Pre-fin	-0,03	-0,10	-0,08	0,10	-0,04	-0,09	-0,11	-0,01	-0,08
	(-0,31)	(-1,15)	(-0,91)	(0,90)	(-0,49)	(-0,89)	(-1,16)	(-0,10)	(-0,55)
Post-fin	0,03	0,00	0,06	0,00	0,14	0,17	0,17	0,12	0,11
	(0,20)	(0,01)	(0,37)	(0,02)	(0,85)	(1,05)	(1,04)	(0,71)	(0,66)
Difference	0,06	0,10	0,14	-0,10	0,18	0,26	0,27	0,13	0,19
	(0,24)	(0,27)	(0,51)	(-0,25)	(0,83)	(1,06)	(1,09)	(0,57)	(0,64)

Panel C. Unexpected inflation

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	0,25	0,29	0,32	0,23	0,14	0,17	0,23	0,38	0,31
	(3,33)	(4,00)	(4,41)	(2,65)	(1,90)	(2,05)	(2,95)	(3,99)	(3,06)
Pre-fin	0,19	0,23	0,22	0,14	0,23	0,12	0,28	0,29	0,29
	(2,24)	(2,67)	(2,56)	(1,23)	(2,72)	(1,27)	(3,23)	(2,18)	(2,06)
Post-fin	0,60	0,61	0,55	0,62	0,07	0,32	0,02	0,52	0,46
	(4,52)	(4,71)	(4,05)	(4,84)	(0,44)	(2,09)	(0,13)	(3,66)	(3,12)
Difference	0,40	0,38	0,33	0,49	-0,16	0,20	-0,26	0,23	0,17
	(3,55)	(3,67)	(3,17)	(3,59)	(-0,23)	(1,59)	(-0,76)	(2,42)	(1,99)

Description: The table exhibits correlation coefficients between quarterly log-returns of commodity indices and quarterly logarithmic changes of US Consumer Price Index. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970-11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970-12/31/2003 and the post-fin period is 12/31/2003-11/30/2013. All the data come from Bloomberg. The first row in each case refers to correlation coefficients and the numbers in brackets denote statistical significances. The panels A, B and C refer realized, expected and unexpected inflation.

Table 7. Correlation between inflation and commodity returns (annual data)

Panel A. Realized inflation

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	0,38	0,29	0,25	0,65	0,32	0,14	0,30	0,55	0,54
	(2,56)	(1,87)	(1,64)	(5,33)	(1,74)	(0,86)	(1,80)	(3,93)	(2,79)
Pre-fin	0,32	0,24	0,30	0,63	0,33	0,14	0,39	0,48	0,64
	(1,84)	(1,38)	(1,74)	(4,49)	(1,45)	(0,76)	(2,04)	(2,83)	(2,66)
Post-fin	0,73	0,69	0,63	0,74	0,08	0,25	0,32	0,65	0,53

	(2,65)	*(2,34)*	*(1,99)*	*(2,70)*	*(0,21)*	*(0,63)*	*(0,82)*	*(2,11)*	*(1,53)*
Difference	0,42	0,45	0,33	0,11	-0,25	0,11	-0,07	0,17	-0,11
	(2,04)	*(1,84)*	*(1,58)*	*(2,00)*	*(-0,18)*	*(0,47)*	*(0,45)*	*(1,60)*	*(0,88)*

Panel B. Expected inflation

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	-0,05	-0,17	-0,14	-0,12	0,04	-0,14	0,07	-0,32	-0,35
	(-0,30)	*(-1,10)*	*(-0,89)*	*(-0,77)*	*(0,19)*	*(-0,89)*	*(0,41)*	*(-2,01)*	*(-1,64)*
Pre-fin	-0,07	-0,18	-0,09	-0,07	0,03	-0,16	0,13	-0,31	-0,26
	(-0,37)	*(-1,03)*	*(-0,50)*	*(-0,39)*	*(0,13)*	*(-0,88)*	*(0,65)*	*(-1,72)*	*(-0,86)*
Post-fin	-0,74	-0,76	-0,76	-0,70	-0,08	-0,44	-0,28	-0,68	-0,72
	(-2,71)	*(-2,91)*	*(-2,83)*	*(-2,42)*	*(-0,19)*	*(-1,19)*	*(-0,71)*	*(-2,30)*	*(-2,52)*
Difference	-0,67	-0,58	-0,67	-0,63	-0,11	-0,28	-0,41	-0,37	-0,45
	(-1,71)	*(-1,27)*	*(-1,64)*	*(-1,57)*	*(-0,20)*	*(-0,67)*	*(-0,92)*	*(-0,74)*	*(-0,81)*

Panel C. Unexpected inflation

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	0,56	0,51	0,51	0,70	0,26	0,39	0,34	0,64	0,63
	(4,25)	*(3,68)*	*(3,68)*	*(6,10)*	*(1,38)*	*(2,62)*	*(2,03)*	*(5,00)*	*(3,54)*
Pre-fin	0,48	0,45	0,55	0,69	0,31	0,44	0,41	0,61	0,66
	(3,02)	*(2,75)*	*(3,60)*	*(5,25)*	*(1,35)*	*(2,71)*	*(2,15)*	*(3,95)*	*(2,74)*
Post-fin	0,81	0,77	0,72	0,81	0,09	0,31	0,34	0,72	0,62
	(3,37)	*(2,98)*	*(2,52)*	*(3,36)*	*(0,22)*	*(0,80)*	*(0,89)*	*(2,57)*	*(1,92)*
Difference	0,33	0,32	0,17	0,12	-0,22	-0,13	-0,07	0,12	-0,04
	(2,45)	*(2,22)*	*(1,90)*	*(2,40)*	*(-0,14)*	*(0,39)*	*(0,52)*	*(1,90)*	*(1,20)*

Description: The table exhibits correlation coefficients between annual log-returns of commodity indices and annual logarithmic changes of US Consumer Price Index. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970–12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The first row in each case refers to correlation coefficients and the numbers in brackets denote statistical significances. The panels A, B and C refer realized, expected and unexpected inflation.

The Tables 8 and 9 present regression coefficients computed against the expected and unexpected inflation.

Table 8. Expected and unexpected inflation betas of commodity indices (quarterly data)

Panel A. Composite indices

	GSCI TR		GSCI SR		GSCI ER		JMCCI		DJUBS	
	β_1	β_2	β_1	β_2	β_1	β_2	β_1	β_2	β_1	β_2
Full sample	5,72	3,73	5,65	2,91	5,35	2,28	9,93	8,59	8,06	7,96
	(5,16)	*(3,85)*	*(5,09)*	*(3,01)*	*(5,02)*	*(2,45)*	*(7,63)*	*(6,00)*	*(6,26)*	*(5,24)*
Pre-fin	3,03	1,21	2,95	0,39	2,88	0,60	8,79	6,17	8,60	6,57
	(2,53)	*(1,12)*	*(2,46)*	*(0,36)*	*(2,49)*	*(0,57)*	*(3,81)*	*(2,87)*	*(3,23)*	*(2,37)*
Post-fin	5,72	3,73	13,77	10,64	12,59	11,08	10,31	10,18	8,03	8,02
	(5,16)	*(3,85)*	*(6,38)*	*(3,35)*	*(5,85)*	*(3,49)*	*(5,72)*	*(3,83)*	*(4,69)*	*(3,17)*

Panel B. Sectorial indices

	GSCI EN		GSCI AG		GSCI IN		GSCI PM	
	β_1	β_2	β_1	β_2	β_1	β_2	β_1	β_2
Full sample	17,51	16,01	3,38	2,21	3,90	2,09	3,41	1,05
	(7,23)	(6,66)	(2,86)	(2,14)	(2,65)	(1,66)	(2,94)	(1,04)
Pre-fin	17,90	15,82	3,95	1,47	1,63	-0,24	4,41	0,88
	(4,01)	(3,87)	(2,97)	(1,23)	(0,95)	(-0,17)	(3,11)	(0,68)
Post-fin	17,56	13,61	2,73	4,94	9,43	11,48	1,50	3,70
	(6,64)	(3,49)	(1,06)	(1,30)	(3,48)	(2,88)	(0,80)	(1,33)

Description: The table exhibits commodities' expected and unexpected inflation betas. β_1 and β_2 refer to regression coefficients referring to unexpected and expected inflation. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970–12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The first row in each case refers to regression coefficients and the numbers in brackets denote statistical significances. The panel A depicts composite commodity indices, while panel B sectorial subindices. The computations are based on quarterly time-series.

Table 9. Expected and unexpected inflation betas of commodity indices (annual data)

Panel A. Composite indices

	GSCI TR		GSCI SR		GSCI ER		JMCCI		DJUBS	
	β_1	β_2	β_1	β_2	β_1	β_2	β_1	β_2	β_1	β_2
Full sample	8,63	-2,27	8,19	-3,73	7,41	-3,03	11,10	2,54	9,80	0,50
	(4,12)	(-1,24)	(3,91)	(-2,05)	(3,81)	(-1,79)	(3,29)	(0,47)	(2,93)	(0,08)
Pre-fin	7,82	-2,24	7,79	-3,61	7,80	-2,44	19,56	9,92	18,80	10,37
	(2,91)	(-1,08)	(2,89)	(-1,74)	(3,48)	(-1,41)	(3,15)	(1,45)	(3,31)	(1,44)
Post-fin	8,63	-2,27	7,67	-40,47	7,08	-45,97	7,01	-31,74	4,09	-36,48
	(4,12)	(-1,24)	(2,41)	(-2,33)	(1,84)	(-2,19)	(1,91)	(-1,59)	(1,17)	(-1,90)

Panel B. Sectorial indices

	GSCI EN		GSCI AG		GSCI IN		GSCI PM	
	β_1	β_2	β_1	β_2	β_1	β_2	β_1	β_2
Full sample	22,04	5,62	3,19	-0,23	8,35	-3,94	4,06	0,35
	(5,08)	(0,67)	(1,52)	(-0,13)	(2,72)	(-1,48)	(0,90)	(0,04)
Pre-fin	27,38	8,29	3,21	0,05	8,93	-3,76	1,33	-4,31
	(4,31)	(0,86)	(1,33)	(0,03)	(2,79)	(-1,52)	(0,25)	(-0,64)
Post-fin	11,78	-40,64	1,13	-3,37	2,88	-55,29	4,25	-11,65
	(2,77)	(-1,75)	(0,16)	(-0,09)	(0,27)	(-0,96)	(0,65)	(-0,33)

Desription: The table exhibits commodities' expected and unexpected inflation betas. β_1 and β_2 refer to regression coefficients referring to unexpected and expected inflation. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970–12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The first row in each case refers to regression coefficients and the numbers in brackets denote statistical significances. The panel A depicts composite commodity indices, while panel B sectorial subindices. The computations are based on annual time-series.

First, consistently with the correlation analysis, the unexpected inflation beta is usually higher than for expected inflation. Second, the betas are remarkably high for energy and composite indices. Finally, in the post-2003 period the betas visibly increased.

The investigations of betas computed against realized inflation (Table 10) confirm the same observations.

Table 10. Realized inflation betas of commodity indices

Panel A. Quarterly data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	4,35	3,76	3,24	16,73	2,58	2,52	1,78	9,50	8,04
	(4,61)	(3,94)	(3,49)	(7,26)	(2,59)	(2,03)	(1,79)	(7,47)	(6,33)
Pre-fin	1,92	1,38	1,48	16,30	2,43	0,26	2,27	7,04	7,88
	(1,90)	(1,35)	(1,51)	(4,02)	(2,16)	(0,19)	(1,87)	(3,27)	(2,98)
Post-fin	13,46	13,32	12,37	17,00	3,04	9,72	1,82	10,29	8,03
	(6,31)	(6,21)	(5,85)	(6,45)	(1,20)	(3,65)	(0,97)	(5,84)	(4,79)

Panel B. Annual data

	GSCI TR	GSCI SR	GSCI ER	GSCI EN	GSCI AG	GSCI IN	GSCI PM	JPMCCI	DJUBS
Full sample	2,56	1,55	1,59	20,10	1,28	1,50	4,23	10,82	10,10
	(1,81)	(1,07)	(1,20)	(4,52)	(1,05)	(0,77)	(0,96)	(3,00)	(2,86)
Pre-fin	1,78	0,95	1,67	22,65	1,23	1,29	-3,22	14,13	18,91
	(1,08)	(0,56)	(1,18)	(3,48)	(0,96)	(0,64)	(-0,44)	(1,81)	(2,66)
Post-fin	12,03	11,30	11,08	15,73	1,47	7,27	5,45	9,93	7,15
	(3,06)	(2,70)	(2,30)	(3,12)	(0,24)	(0,73)	(0,95)	(2,44)	(1,77)

Description: The table exhibits commodities' expected and realized inflation betas. GSCI TR, GSCI SR and GSCI ER are S&P-GSCI Commodity Indices: Total Return, Spot Return and Excess Return Indices. GSCI EN, GSCI AG, GSCI IN and GSCI PM are S&P-GSCI Commodity Subindices referring to Energy, Agriculture, Industrial Metals and Precious Metals. JPMCCI and DJUBS refer to JP Morgan Commodity Curve TR Index and Dow Jones-UBS Commodity TR Index. The examined period is 12/31/1970–11/30/2013, unless only shorter time-series are available. The pre-fin period is 12/31/1970–12/31/2003 and the post-fin period is 12/31/2003–11/30/2013. All the data come from Bloomberg. The first row in each case refers to regression coefficients and the numbers in brackets denote statistical significances. The panel A refers to quarterly time-series and the panel B to annual time-series.

The changes are sometimes really impressive, as for example in the case of quarterly S&P-GSCI TR data, the correlation soared from 1,92 in the non-financialized market to 13,46 in the financialized markets. To sum up, it can be observed that in the post-2003 period the inflation hedging properties of commodities improved and were superior to the earlier decades. This corresponds with third supposition of this paper.

5. Conclusions

The commodity futures markets are an important tool for the portfolio management and asset allocation. However, the recent profound changes in the markets may cast doubt whether the commodities retained their long-term characteristics and properties. The computations suggest, that commodities can still be effectively used in the tactical asset allocation, however their nature seems to have changed slightly.

First, the interdependence to the business activity seems to be stronger now than it was in previous decades. The correlation is higher and the economic betas soared. In other words, it seems that the commodity returns are now even more dependent on general economic conditions.

Second, the lead/lag behaviour of commodities in relation to the economy changed slightly. Their relation with the business cycle became more equity-like. In other words, in the last decade the commodities were coinciding or even somewhat a leading indicator of business economy. This anticipatory behaviour generally contradicts with the previous theoretical and empirical evidence, which pointed that commodity prices usually lag or coincide economic activity.

Thirdly, it appears, that the commodities retained their inflation hedging properties. Actually, the interrelation with the CPI changes strengthened in recent years, so inflation betas increased. It still perfectly makes sense to hedge portfolio returns against inflation with commodity futures.

The presented research has one important limitation. Although it is shown, that the interrelations between commodity markets and economic aggregates have changed since the commodity markets became financialized, this paper does not document, nor does it prove firm casual links between the two phenomena. In other words, the explanation cannot be excluded, that the alterations emerged due to some other reasons, or even that they are simply period-specific. This issue should be investigated in details in further research.

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Stocks of Firms under Reorganization Procedure

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Abstract

This paper aims to analyze the market reaction of US firms following their reorganization procedure announcement. As a first step, an analysis of stock prices of a sample of U.S. companies having filed for chapter 11 during the period 2000–2012 is carried through the use of indexes of prices. As a second step, we compare the stock prices of these firms with the ones of "similar" firms that have not been affected by this type of event. The results report a lower average stock return of companies under judicial protection throughout the considered time horizon, except for the period 2008–2009.

Keywords: reorganization procedure, index of prices, chapter 11

1. Introduction

During the subprime crisis, many American firms filed for chapter 11 (reorganization procedure). Li and Zhong (2013) report that, since then, US media suggest investment opportunities in the capital of firms under reorganization procedure. Nevertheless, only a few studies about the market valuation of companies under chapter 11 process have been led. The probable reasons of this lack of research are the difficulty of access to information on stocks of companies under reorganization process and, the alleged lack of activity related to this market. This paper exploits a unique database from Bloomberg which makes it possible to analyze the return of stocks under reorganization process. Regarding, the alleged lack of activity of this market, there is actually an active market for the exchange of stocks of firms under chapter 11 (Li & Zhong, 2013). These authors also report a transfer of these stocks from institutional to private investors. According to Kumar (2009), these individual investors are characterized by a riskier behavior. He compares "chapter 11 stocks" to lottery tickets characterized by a low initial investment, a very low probability of significant gain and a very strong probability of losing the amount that has been invested initially.

The few studies regarding the valuation of stocks under chapter 11 (Morse & Shaw, 1988; Datta & Iskandar-Datta, 1995; Hotchkiss & Mooradian, 1997; Altman, 1998; Indro et al., 1999; Chi & Tang, 2005; Chi & Tang, 2007; Brédart & Finet, 2012; Li & Zhong, 2013; Li, 2013) lead to contrasting results. As per Li and Zhong's (2013), investing in stocks of firms under chapter 11 is, on average, unprofitable. However, Brédart and Finet (2012) report positive abnormal returns for the concerned stocks during the subprime crisis period.

The aim of this article is to understand the reaction of the U.S. stock market following to reorganization process announcement date during the period 2000–2012. In this perspective, we construct, upon a unique database of 435 firms, an index based on stock prices following their announcement of filing for chapter 11. We also focus our attention on the period of the subprime crisis (2008–2009) to observe the positive abnormal returns reported by Brédart and Finet (2012) during this period. In a second step, we compare the prices of our initially selected stocks to the ones of stocks from 'similar' firms regarding their size and sector; these firms have not been affected by a reorganization procedure between 2000 and 2012. The Comparison of two equity portfolios makes it possible to compare the performance of the two sub-samples on an identical period. Mooradian and Hotchkiss (1997), Indro et al. (1999) and Chi and Tang (2005) report that the returns of the shares of firms under reorganization procedure can be higher than those of healthy securities.

The analysis of the index of prices relative to firms under reorganization process reports, for the period 2000–2012, a gradual decline in stock prices over a period of 100 days following the announcement date of the filing for chapter 11. For the period 2008–2009, the index of prices reported contrasting results. This observation leads us to compare firm characteristics during the two periods 2000–2012 and 2008–2009. Moreover, the comparative

analysis led between our initial index and the one reflecting the evolution of stock prices of "similar" firms that did not recourse to any bankruptcy protection law between 2000 and 2012 allows us to remark a different evolution of stock prices for the period 2008–2009.

The results of this study shed light to the valuation of securities of firms under reorganization process. This paper contributes to the literature regarding financial distress and bankruptcy. This study may also be of interest for investors to allow them to adjust their investment strategies by considering stocks of firms under chapter 11 in their choice of investments.

The rest of the article is as follows. The second part will present our population and detail the methodology used. The third part of this article will present the results of our analyzes. The last section will discuss the results and propose some research avenues.

2. Literature Review

According to Chi and Tang (2007), very few studies have addressed the impact of the release announcement of filings for reorganization procedures on the stock returns of firms. Following the recent wave of bankrupcies, this topic is of significant importance (Coelho, Kose, & Taffler, 2010). In addition, the study of Bris et al. (2006), conducted over the period 1995–2001, suggests that their study could have been more interesting if it had been led on a period of recession. The academic literature provides more about stock prices before (Kalay et al., 2007) and after (Cunney & Thomas, 2004) the reorganization procedure. Nevertheless, very few studies focus on the analysis of stock prices during the reorganization procedure.

Because the reorganization procedure is costly (Beaver, 1968) and because the notification announcement for a reorganization procedure is perceived by the investors as the sign of potential problems for the firm (Clark & Weinstein, 1983), we expect a negative impact on stock prices. Clark and Weinstein's (1983) study, led over the period 1938–1979, reports a decline in profitability around the release of the announcement of a reorganization procedure. Chi and Tang (2007), report a positive abnormal return of 25 percent for stocks of firms under reorganization procedure for the period of one month following the filing date for chapter 11.

Over a longer period after the announcement, some events such as news regarding the plan of reorganization may impact the prices of stocks of firms under reorganization procedure (Chi & Tang, 2005). As per Li and Zhong's (2013) study, realized on the period 1998–2006, investing in stocks of firms under chapter 11 of the American bankruptcy code is, on average, unprofitable. Brédart and Finet (2012) report, for the subprime crisis period, positive abnormal returns during the first month following the announcement date. Finally, Morse and Shaw (1988) conclude to the absence of abnormal returns by investing in stocks of firms under reorganization procedure.

Regarding comparative studies, Mooradian and Hotchkiss (1997), Indro et al. (1999) and Chi and Tang (2005) report that the returns of the stocks of firms under chapter 11 can be positive and significantly higher than those of healthy securities for several holding periods.

3. Data and Methodology

3.1 Data

In this study, we utilize a sample of 870 firms originally quoted on the National Association of Securities Dealers Automated Quotations (Nasdaq) and the New York Stock Exchange (NYSE). Out of this sample, 435 firms filed for chapter 11 of the United States Bankruptcy Code between 2000 and 2012. For each firm, we collect daily stock prices on a period of 100 business days after the filing date for chapter 11. In a second step, using the nearest neighbour method, we build a matched pair of 435 financially healthy companies (without any filing for bankruptcy protection law during the timeframe) selected among firms listed on the Nasdaq and the NYSE. We match for industry (SIC code) and firm size (total assets) as it is the case in many comparative studies regarding bankruptcy (Altman, 1986; Daily, 1996; Donoher, 2004). For this second sub sample, stock prices have also been collected after the filing date for chapter 11 of each failed counterpart. For example, Lehman Brothers filed for chapter 11 on 15 September 2008 and its healthy counterpart is Goldman Sachs; for both firms, we take into consideration the hundred business days after 15 September 2008. We utilized Bloomberg database to collect financial data.

3.2 Methodology

The analysis of stock prices is usually tackled by the use of ARCH (Auto-Regressive Conditional Heteroskedastic; Engle, 1982) and GARCH (Generalized Auto-Regressive Conditional Heteroskedastic; Bollerslev, 1986) models. In this article, we use a "user friendly" methodology based on the calculation and

comparison of price indexes in order to analyze the reaction of stock prices following the potential filing for reorganization procedure of US firms between 2000 and 2012. This methodology is easier to apply for non-academics.

To this aim, we first create an index based on stock prices of our initial business population (placed under reorganization process). To this end, we set the initial value of the index on the announcement date for chapter 11. Then, we compare, per firm, the prices of the 100 days after the announcement date with the price on the filing date. It allows us to build our first index.

$$Index_{it} = \frac{Price_{it}}{Price_{i0}}$$

With,

$Index_{it}$: value of the index of prices of firm i at time t;

$Price_{it}$: stock price of firm i at time t;

$Price_{i0}$: stock price of firm i on the filing date for chapter 11.

Then, per day, we calculate, the average of the indexes obtained per firm. Aiming to verify the existence of positive abnormal returns during the subprime crisis, we carry the same work for companies having filed for reorganization procedure over a period of 1 year from the announcement date of filing for chapter 11 of the bank Lehman Brothers (15 September, 2008). In addition to comparing price indexes, we statistically compare some characteristics (size, sector of activity and financial ratios) of firms for these two sub-periods.

In a second step, we compare the prices of our initially selected stocks to the ones of stocks from 'similar' firms regarding their size and industry (Altman, 1986; Daily, 1996; Donoher, 2004); these firms have not been affected by a reorganization procedure between 2000 and 2012. In order to compare the two indexes on identical periods, we set, for each healthy firm, the initial value of the index on the announcement date for chapter 11 of his "failed" counterpart. The confrontation of such indexes makes it possible to compare the stock prices of the two sub-samples of firms avoiding biases inherent to conventional event methodologies.

4. Results

4.1 Descriptive Statistics

Table 1 reports descriptive statistics for firms under reorganization process, both for the period 2000–2012 and for the period of one year following the entry into chapter 11 of the bank Lehman Brothers. This table also shows the results of tests comparing variances (Levene's test) and means (Student's t test) for four firm characteristics.

Table 1. Descriptive statistics for firms under reorganization process

	2000–2012			LEHMAN + 1year			Levene test		Student test	
	Number	Mean	Std.Error	Number	Mean	Std.Error	F	p	T_stat	p
Total assets	435	4862.36	37488.26	60	21001.28	98209.71	18.72	0.00	1.26	0.21
Total debt/Total assets	389	65.79	109.08	60	104.92	248.08	23.62	0.00	1.44	0.16
Return on assets	384	-44.40	65.64	59	-37.06	45.67	0.59	0.44	0.93	0.35
Current ratio	362	1.26	1.45	53	0.93	0.79	1.53	0.22	-1.60	0.11

The results of mean comparison tests do not indicate significant differences (at 5 percent threshold) regarding size, solvency, profitability and liquidity between the two periods. Regarding the size (Total assets) of firms under reorganization procedure, we may notice that the ones which have filed for chapter 11 on the period of one year following the entry into chapter 11 of the bank Lehman Brothers are, on average, bigger. Regarding the ratio Total debt/Total assets, firms which have filed for chapter 11 on the period of one year following the entry into chapter 11 of the bank Lehman Brothers have, on average, a larger proportion of debts. The liquidity ratio (current ratio) is smaller for firms which have filed for chapter 11 on the period of one year following the entry into chapter 11 of the bank Lehman Brothers. Finally, the means values for the return on assets are negative for the two sub-samples; this means that, on average, firms made losses.

Table 2 shows the distributions of the two samples of firms under judicial protection by sector of activity.

Table 2. Firms under judicial protection by sector of activity

	2000/2012	*LEHMAN +1 year*
Mining	17	5
Construction	6	0
Manufacturing	150	30
Transportation & Public Utilities	83	5
Wholesale Trade	14	2
Retail Trade	45	3
Finance, Insurance, Real estate	34	8
Services	86	7
Total	435	60
Chi square test		
Pearson Chi square		15.36
ddl		7
p		0.03

Comparing the two time periods, we show different distributions with respect to the sectors. Over the subprime crisis period, a relatively larger proportion of manufacturing and financial companies filed for chapter 11. Manufacturing, financial and real estate are the sectors that have been most affected by the crisis. While the crisis had first been limited to the real estate sector, in a second time, it has spread to the financial sector (Aglietta, 2008). Due to the credit crunch, the crisis has also affected while the industrial sector (i.e., the real economy (Attali, 2008)).

4.2 Price Indexes

As mentioned above, in a first step, we analyze the companies that have experienced difficulties related to bankruptcy only. In a second step, we compare these to a paired sample of healthy firms.

Figure 1 shows the price indexes of firms having filed for chapter 11; we distinguish the two periods previously mentioned (Lehman + 1 year and 2000–2012).
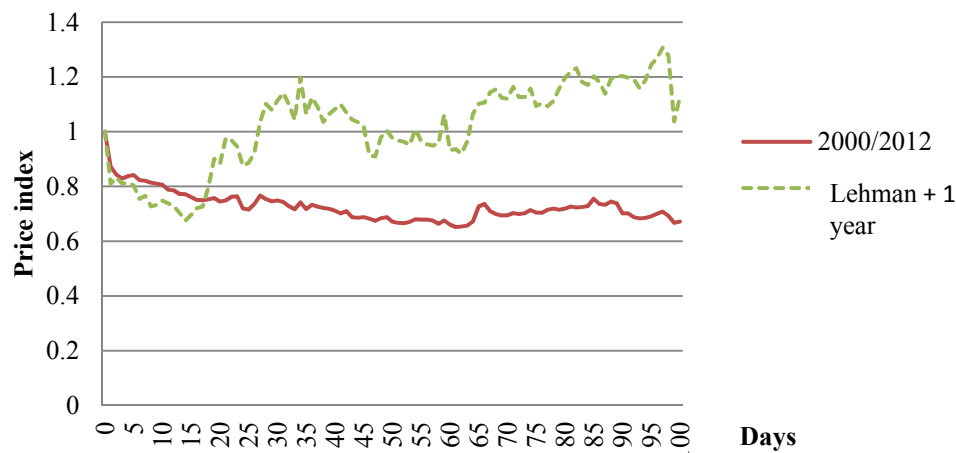
Figure 1. Price indexes of firms having filed for chapter 11 (till 100 days after the announcement date)

From Figure 1, we can first remark that, over the period 2000–2012, the index of prices of firms under reorganization process, follows a negative trend during the first 100 trading days following the announcement. We observe an important negative market reaction on the announcement date (-12.8 %), which is followed by a gradual decline in the index. Regarding the period of financial crisis, the interpretation is quite different. A more brutal reaction to the announcement (-19%) is observed. The latter is also followed by a decline in the index over the first fifteen trading days following the announcement. However, after this period, the stock prices of these firms rise. For certain periods, the index reaches higher levels than the one recorded on the date of filing for chapter 11.

In a second step, we compare firms that have been under reorganization process with a paired sample of firms not concerned by a bankruptcy protection procedure. For each firm under reorganization process, we selected a healthy firm from the same industry and approximately of the same size. We then have a paired sample 870 firms. Figure 2 shows both the index relative to firms under reorganization procedure and the index relative to healthy firms.
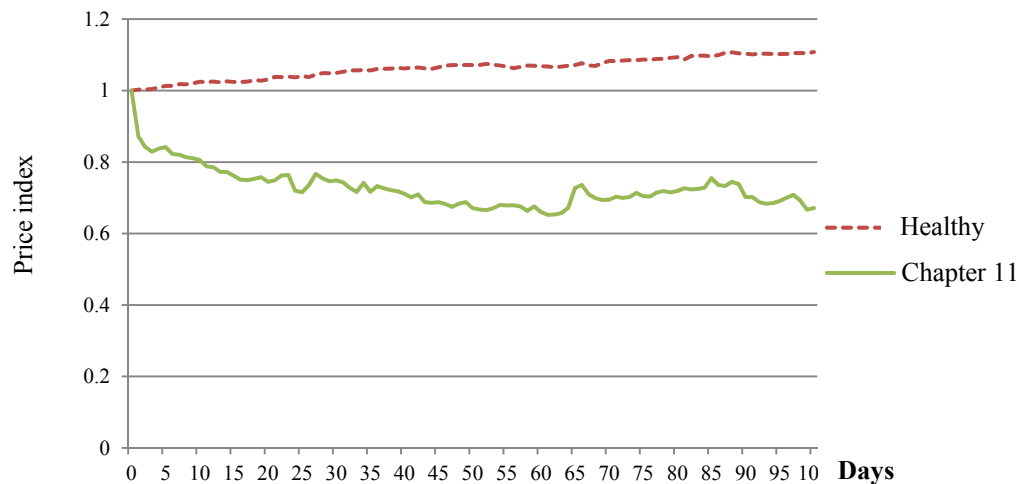
Figure 2. Price indexes relative to firms under reorganization procedure and to healthy firms over the period 2000–2012

Figure 2 shows a positive, stable and continuous trend for index relative to healthy firms. In contrast, the index relative to firms under reorganization process is less stable and displays, a negative trend. We also realized this comparison over the period 2008–2009 (Figure 3).
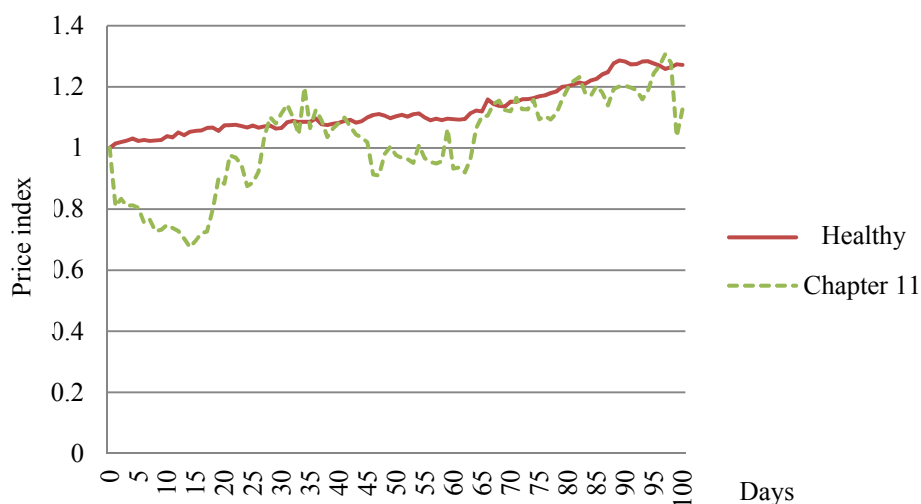
Figure 3. Price indexes relative to firms under reorganization procedure and to healthy firms over the period 2008–2009

Figure 3 shows that, during the subprime crisis, the index of prices relative to firms under chapter 11 has outperformed the one of healthy firms for different holding periods. For example, investing in a basket of shares of firms under reorganization process between 14 and 97 days after the filing date for chapter 11, makes it possible to benefit from an appreciation of the corresponding index of 93.5% versus 19.5% for an investment in

a basket of comparable healthy firms.

5. Discussion and Conclusion

The aim of this article was to analyze the prices of stocks of firms initially quoted on traditional U.S. equity markets after the announcement date of filing for reorganization process. The objective was to observe the behavior of the investors concerned by the profile described by Kumar (2009). To this end, we firstly carried out analyzes on a sample of firms that have filed for the chapter 11 of the US bankruptcy code between 2000 and 2012. In order to observe the trend of positive abnormal returns reported by Brédart and Finet (2012), we paid particular attention to the period of the subprime crisis. These first observations, relative to firms that have experienced difficulties related to bankruptcy, report significant differences between the subprime crisis period and the period 2000–2012. Over the period 2000–2012, we observe a gradual decline in the index. This is not the case for the period following the bankruptcy of Lehman Brothers. For this period, the trend of the index is positive; this result is in line with the conclusions of Brédart and Finet (2012) showing, during the subprime crisis, positive abnormal returns for certain holding periods. Different characteristics of the firms under reorganization process were compared between the two periods. The results show that firms that have announced their filing for chapter 11 during the financial crisis are not significantly different from other in regards to size, profitability, liquidity or solvency. In contrast, the frequency distributions of firms by sector of activity are significantly different for the two periods.

From these first analyzes, let us first notice an important negative impact on stock prices the few days after the announcement date for the reorganization procedure; this result is in line with Clark and Weinstein (1983). We may also notice, for the period 2000–2012, an overall negative trend for the index relative to firms under reorganization process; this result is in line with Li and Zhong's (2013) reporting that investment in the securities of companies under judicial protection is on average unprofitable. However, during the subprime crisis, the picture is significantly different as highlighted by Brédart abd Finet (2012). Accounting characteristics of the two samples are not significantly different; however, the sectors that are affected are different.

In a second step, we compared the prices of stocks relative to firms under chapter 11 with prices of "similar" healthy firms. This comparative analysis, initially conducted over the period 2000–2012, shows that the trend of the two indices is totally different and clearly in favor of healthy firms. A similar analysis was also conducted over the period of 2008–2009; the results are significantly different; for certain holding periods, investing in a basket of shares of firms under reorganization process is more profitable than investing in a basket of comparable healthy firms. This finding is in line with Hotchkiss and Mooradian (1997), Indro et al. (1999) and Chi and Tang (2005) reporting that the returns of stocks relative to firms under judicial protection can be positive and significantly higher than those of stocks relative to healthy firms.

According to our analyses, results related to the period of the subprime crisis could be due to differences regarding the distribution of activity sectors. Another explanation could be intrinsic to the analysis period. Due to the loss of confidence in conventional finance, the subprime crisis may have had the effect of transferring the assets of individual investors from traditional markets to less regulated markets.

The results are contingent on our business population; it would be useful to conduct a similar study on a different market. Moreover, as research avenue, the use of ARCH (Auto-Regressive Conditional Heteroskedastic) and GARCH (Generalized Auto-Regressive Conditional Heteroskedastic) models could bring more robustness to the results of this study. The results of this study shed light to the valuation of securities of firms under reorganization process. This paper contributes to the literature regarding financial distress and bankruptcy. This study, aiming to analyze the return of stocks of firms under reorganization procedure, may also be of interest for investors to allow them to adjust their investment strategies by considering stocks of firms under chapter 11 in their choice of investments for certain holding periods.

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An Empirical Study of Customer Satisfaction towards Bank Payment Card Service Quality in Ho Chi Minh Banking Branches

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Abstract

Automated Teller Machines (ATMs) is very important for improving the banking service quality that can increase customer satisfaction by helping them to enjoy safe and convenient access. The investigation in this study is implemented by surveying the level of satisfaction among customers who are doing transactions at Vietnamese banking branches. Based on the model of service quality with the selected five key factors of tangible, reliability, responsiveness, communication, and security, the author aims at exploring significant dimensions that have much impact on customers' satisfaction with banking services.

The data are analyzed by using multiple statistical analyses including the analysis of exploratory factor, reliability, correlations, and multiple linear regressions. The results indicate that customer satisfaction has a positive impact on tangible and reliability factor, whereas responsiveness is the main cause of customer dissatisfaction. These findings make significant contributions to improve the service quality of bank payment cards in Ho Chi Minh city, Vietnam and to increasing competitiveness of the branches in the field of card self-services.

Keywords: automated teller machines, service quality, banking, customer satisfaction

1. Introduction

In Vietnam, as more and more businesses are getting global and the world economy is consistently changing, trade activities can cross the borders within minutes or short time. Not surprisingly, the bank's service in the payment system has caught the much attention, where customers are always concerned with the correctness, the safety, and the quickness with effectiveness. Thus, with the continuous development of foreign and domestic business, the activities of the demand for cash payment and/or deposit and money transfer are also getting frequent. For instance, the credit card has been increasingly popular in Vietnam as other developed countries.

Besides the traditional and credit card services, the commercial banks of Vietnam are constantly expanding a variety of services such as varied mortgage services, Internet services, the services between government and citizens, etc., where the banks try their best to grab at new or potential opportunities for their most benefits.

Since the early 90's, the Bank for Foreign Trade of Vietnam also planned to make a huge change in enhancing the banking services such as banking networking and the credit card application. Although the change implementation reaped significant harvest, some barriers such as the technological issues have been encountered and the difficulties such as people's habits and cheating events still exist in developing banking services. As such, many bank services mushroomed, including Bank of Agriculture and Rural Development, and tried to formulate competitive strategies with a view to dominate the banking market with better services, particularly in the card services.

Therefore, embracing competitive strategies of quality card services to satisfy customers' demand has played a very important role in banking services. After realizing the reality and importance of card services for the banking business, the understanding of customers' satisfaction can be obtained through surveying a specific case of banking branches in Ho Chi Minh city, Vietnam. In turn, it can also contribute to help building the competitive strategies for the banks in the field of card services.

Automated teller machines (ATMs) came into being in 1968 and ever since then have been widely utilized. Since then, almost all banks take the advantages of using ATMs as a tool to serve the customers' needs. Upon seeing this trend, although it was quite late, banks in Vietnam started to issue the cards with comprehensive functionalities and utilities from the year 2007. The following objectives of the current study are:

Contingency analysis of business operations of the bank payment cards since the start-up of running business from year 2007 to the first half of year 2012.

In-depth analysis of customers' satisfaction with banking card services at Ho Chi Minh branches.

Provide alternatives to improving the service quality of bank payment cards.

2. Literature Review

The basic literature supports the notion that customer loyalty involves customer satisfaction, customer characteristic, dimensions of service quality and technology-based self-services in banking as the main elements of customer loyalty.

2.1 Customer Satisfaction

There have been many other definitions of customer satisfaction based on different aspects; such as, Kotler and Keller (2009) directly defined "satisfaction can also be a person's feelings of pleasure or disappointment that results from comparing a product's perceived performance or outcome with their expectations" or Sureshchander et al. (2002) expressed that "consumer's level of satisfaction is determined by his or her cumulative experience at the point of contact with the supplier". These two definitions examined the concept of customer satisfaction under the gap between pre-purchase and post-purchase or the gap between previous performance and current one.

2.2 Customer Characteristics

With the trend towards, the impact on service quality evaluation is done by survey and this would give out a chance to study more about providing services based on customer characteristics and technologies.

The customer characteristics, including self-motivation and experience, should play a very important role, if they are to do the services by themselves. There are five categories, Dabholkar (1996), Rogers (1995), and Parasuraman et al. (1991), to distinguish the customer characteristics and their determinants.

(1) Demographics (age, education, social integration);

(2) Personality (impatience, social risk, self-esteem);

(3) Behavior (self-motivation, consumption rate, technological experience);

(4) Relationship (organizational commitment);

(5) General attitudes (need for independence, need for social interaction and attitude towards using technology).

2.3 Definition of Service Quality

Service quality was also defined as "any behavior or act based on a contact between two parties: the provider and the receiver" by Kotler and Keller (2009). Quality is one of the things that consumers look for in an offer, which service happens to be one (Negi, 2010). Service quality in the management and marketing literature is the extent to which customers' perceptions of service meet or exceed their expectations for example as defined by Bowen and David (2005). Thus, service quality can intend to be the way in which customers are served in an organization which could be good or poor. Moreover, in the study of Wang, Nguyen and Tran (2014), they have defined some factors that have the strongest impact on the overall satisfaction of staff so that employees can improve much the serving to reach a certain level of service quality delivered to customers.

2.4 Dimensions of Service Quality

Ten determinants can have influence on service quality gap were described by Harvey (1988). They are competence; courtesy; credibility; security; access; communication; understanding; reliability; responsiveness.

2.5 Definition of Banking Service Quality

In banking field, Mohamed and Shirley (2009) emphasized that banks have to notice about the quality of their services because service quality is considered the core of strategic competition. As the research is focused on examining the level of service quality as perceived by customers and its effect customer satisfaction, the banking service quality is defined as "the overall excellence of bank service that satisfies user expectation".

2.6 Technology-Based Self-Services in Banking

Teachnology-Based Self-Service in Banking are technological interfaces that enable customers to get a service independent of direct services without employee involvement (Meuter et al., 2000), through person-to-technology service delivery (Dabholkar, 1994). It is necessary for banks and other financial-related intermediaries to have information processing self-service technologies (Sannes, 2001). Self-services banking is the use of self-service technologies in banking. Examples of self-services banking include banking by telephone and the Internet, ATM, interactive kiosks and other self-service terminals.

As Sannes (2001) stated, the literature deemed three main areas important in conceptualizing a framework of self-services banking, they are the strategy about firm level value creation combined with bank specific issues, self-services banking information exchange and its implications on the customer relationship and STT added to a principal understanding of technology-based service encounters in a customer viewpoint. The following figure is Self-Services Technology-SST Model.

2.7 Service Quality Model or GAP Model

A customer's expectation of a particular service and their service perceived sometimes is not equal. Therefore, it leaves a gap. Harvey (1988) identified seven major 'gaps' that cause unsuccessful delivery:

(1) Gap between customers' expectations and management perceptions.

(2) Gap between management perceptions and service specifications.

(3) Gap between services specifications and services delivery. This gap is a result of owing to the services personnel, such as poor training or lack of teamwork.

(4) Gap between service delivery and external communication.

(5) Gap between the discrepancy and customer expectations and their perceptions of the service delivered.

(6) The discrepancy gap between customer expectations and employees' perceptions;

(7) The discrepancy gap between employee's perceptions and management perceptions.
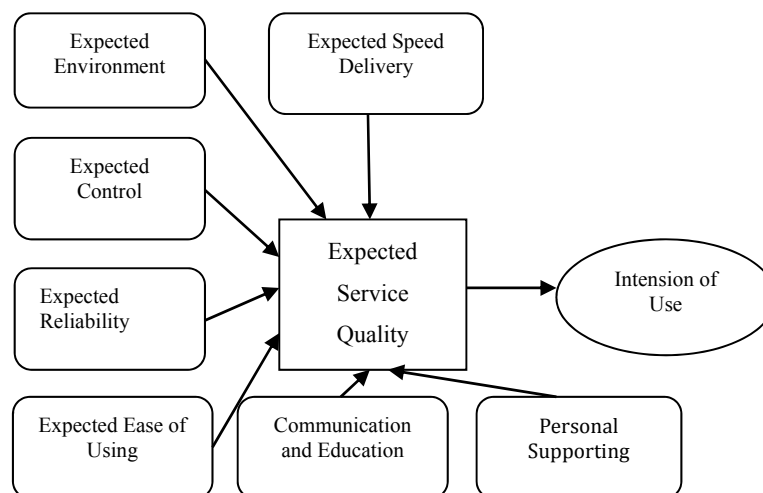
Figure 1. SST Attitude/ Intention to Use/Overall effect model

Dabholkar (1996) found out that the speed, enjoyment, controlling, reliability, communication, the ease to use of technology, and personnel supporting are those kinds of important attributes in measuring and utilizing the Technology-Based Self-Service towards customers.

(1) Speed to Deliver Services: Based on the speed of delivery, customers can easily choose and evaluate the technology-based self-service options, which were initially suggested by Dabholkar (1996).

(2) Enjoyable Services: Foley et al. (1990) indicated, the pleasure is a very important factor in determining how users evaluated quality of computer technology.

(3) Controlling process: As Langeard et al. (1981) stressed, using self-service technologies that customers may feel with the extent of control is one of the most important satisfaction factors. However, Bateson (1985)

indicated that control is rather a complex concept matter like behavior, or decision making in personal service.

(4) Reliability: Reliability is the fact that a scale should consistently reflect the construct it is measuring. Ram (1989, p. 24) recommended four types of risks making customers more resistant to innovations in general: Functional risk; Economic risk; Social risk; Psychological risk.

(5) Easy to Use: Kelley et al. (1990), easy to use is a factor that help and satisfy customers, where they are willing to manage with clear mind and little effort. In a computer environment, Foley et al. (1990) also suggested three distinctive kinds of ways for easy-to-use services by being cognitive, perceptive and motoring to achieve the ergonomic qualities.

(6) Communication/Education: Currently, many banking institutes provide 24 hours self-services points such as ATMs and the persons on duty for exceptional handling with customers' requirements. Therefore, not only the staffs need specific trainings but also customers or clients have to be trained or self-trained in one way or another such as the basic application of computer and related networking.

- Personnel Supporting: For a bank providing 24 hours a day all the year, day time service is no doubt convenient and easy handling whether it is dealt with on the counter or self-service points such as ATMs and Internet access.

3. Methodology

3.1 Research Hypotheses

Among general instruments, the most popular model used for evaluation of service quality is SERVQUAL, a well-known scale developed by Parasuraman et al. (1988). The author selected five dimensions of Parasuraman's study and summarized them as below:

Security: The service offer free from risks and hazards defects or doubts. How company can provide bodily safety, financial security as well as privacy.

Communication: Company can offer easy understood communication, such as language, clear explanation.

Tangibles: The physical evidence of the service is consisted of physical facilities, tools and equipment and so on.

Reliability: The ability to perform the service as promise in a dependable and accurate manner.

Responsiveness: the willingness of service providers to help clients and satisfy their needs, immediately replies to their inquiries, and solve their problems as quickly as possible.

To provide focus and direction, research hypotheses of the current dissertation were formulated. They are as follows:

H1: Communication has a positive effect on customer satisfaction.

H2: Security has a positive effect on customer satisfaction.

H3: Tangible has a positive effect on customer satisfaction.

H4: Reliability has a positive effect on customer satisfaction.

H5: Responsiveness has a positive effect on customer satisfaction.

Data were primarily collected through questionnaires at bank branches among the area of Ho Chi Minh City. Two hundred questionnaires were sent to customers who did transaction at the bank or ATMs through email, letter and directly.

3.2 Measurement Instrument

The title of the research's questionnaire is "Customer satisfaction of ATM services in Ho Chi Minh city". The questionnaire used in this survey is composed of four parts: (1) demographic information questions; (2) 10 questions of using banking ATMs service; (3) 26 questions of satisfaction towards: reliability, tangible, communication, responsiveness and security and (4) 01 question of overall satisfaction level.

3.3 Data Collection

There were totally 500 questionnaires delivered; however, there were only 415 pieces collected with only 400 valid observations, which represented a response rate of 80%. Modes of data collection in our survey are (1) telephone; (2) Mail (post); (3) Online surveys; (4) Personal in-office surveys; (5) Hybrids of the above.

3.4 Method of Data Analysis

Questionnaire Validity: Validity refers to whether the questionnaire or survey measures what it intends to measure. The overriding principle of validity is that it focuses on how a questionnaire or assessment process is

used. Content validity referred to whether the instrument can cover items that purpose to cover. Mills and Morris (1986) recommends that literature had to be reviewed to get the theoretical knowledge about the content or definitions of concepts that are used before designing the instrument for the particular study.

3.5 Questionnaire Reliability

Reliability indicates degrees of consistency between multiple measurements of a variable. The lower limit for Cronbach's alpha is .70, although it may decrease to .60 in exploratory research. The present study adopts Fabrigar's (1999) suggestions with the value 0.6 deemed the lower limit of acceptability. And, to measure item reliability, we regard on the item-to-total correlation (the correlation of the item to the summated scale score). It is suggested that the item-to-total correlations should exceed 0.3.

Exploratory factor analysis (EFA) is a technique within factor analysis whose overarching goal is to identify the underlying relationships between measured variables. In multivariate statistics, EFA is a statistical method used to uncover the underlying structure of a relatively large set of variables.

Multiple regression analysis helps us to predict the value of Y for given values of (X1, X2, …, Xk)

The objective of multiple regression analysis is to use the independent variables whose values are known to predict the single dependent value selected by the researcher. By multiple regressions, we mean models with just one dependent and two or more independent (exploratory) variables. The variable whose value is to be predicted is known as the dependent variable and the ones whose known values are used for prediction are known independent (exploratory) variables.

In general, the multiple regression equation of Y on X1, X2, …, Xk given by:

$$Y = b0 + b1\ X1 + b2\ X2 + … + bk\ Xk$$

Here b0 is the intercept and b1, b2, b3, …, bk are analogous to the slope in linear regression equation and are also called regression coefficients. They can be interpreted the same way as slope. Thus if bi = 2.5, it would indicates that Y will increase by 2.5 units if Xi increased by 1 unit.

Besides, the standardized regression coefficients (β) reflect the relative impact on dependent variable of a change in one standard deviation in either variable. Now that we have a unit of measurement, we can determine which variable has the most impact.

R2-coefficient of determination: Once a multiple regression equation has been constructed, one can check how good it is (in terms of predictive ability) by examining the coefficient of determination (R2). R2 always lies between 0 and 1. The closer R2 is to 1, the better is the model and its prediction.

Correlation Analysis: The correlation coefficient, denoted by r, is a measure of the strength of the linear relationship between two variables. The correlation coefficient takes on values ranging between +1 and -1. If correlation coefficient equal to 0 indicates no linear relationship, +1 indicates a perfect positive linear relationship: as one variable increases in its values, -1 indicates a perfect negative linear relationship: as one variable increases in its values. In details, if correlation coefficient values between 0 and 0.3 (0 and -0.3) indicate a weak positive (negative) linear relationship via a shaky linear rule, between 0.3 and 0.7 (0.3 and -0.7) indicate a moderate positive (negative) linear relationship via a fuzzy-firm linear rule, between 0.7 and 1.0 (-0.7 and -1.0) indicate a strong positive (negative) linear relationship via a firm linear rule.

4. Data Analysis and Results

4.1 Determinants Impact on Customer by EFA

Firstly, by the questionnaires, the study may introduce a survey to understand the perceptions of customers–a distinct and important demographic group–on how they intend to interact with their banks. In Table 1, we present Statistics of Customers' Characteristic who are using ATM services and details of follows:

Table 1. Statistics of customers' characteristic who are using ATM services

Questions	Contents	Frequency	Percentage %
How do you get to know ATM Services?	Doing transaction here	180	45
	Heard from friends, relatives.	176	44
	Internet, newspaper.	196	49
	Television, radio.	206	51.5
	Panel	180	45

	Any other-please specify	146	36.5
What are the positive features of ATM services?	Safety and security	218	54.5
	The cards are easy to keep and use	398	99.5
	The cards are well- decorated	306	76.5
	Time savings, 24/365	358	89.5
	Satisfied with service quality	110	27.5
	Any other-please specify	58	14.5
What are the uncomfortable features/issues of ATM services?	Poor money quality	94	23.5
	Delay in card delivering	100	25.0
	Machine problems	148	37.0
	Card locking	136	34.0
	Unsecured	266	66.5
	Unsuitable location	250	62.5
What are your recommendations to improve ATM service quality?	Better customer service	316	79
	Good technological machine	112	28
	Prompt card delivery	126	31.5
	New convenient locations for ATM	316	79
	More withdrawal limit	100	25.0
	Any other-please specify	88	22

Before doing factor analysis, we used Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett Test of Sphericity to verify if the 26 items of the questionnaire is suitable for factor analysis. As shown in Table 2 the KMO is higher than 0.7 and the significance is lower than 0.01. Then we concluded that the 26-subject questionnaire is suitable for factor analysis.

Table 2. KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.765
Bartlett's Test of Sphericity	Approx. Chi-Square	2.393E3
	df	235
	Sig.	.000

Factor analysis was also carried out on 3 items (A6, A9, A26) with relatively low factor loadings (<0.5) and difference of factor loading within 0.1 were eliminated, thus 23 remained. After performing factor analysis, 23 items was finally summarized to 7 underlying factors and they explain 70,179 percent of variance.

As Table 3 shows, 7 underlying factors were summarized as the 6-dimension. Firstly, the 6-item X1, X2, X3, X4, X5, and X10 is Tangible. Secondly, the 2-item X7 and X8 is Reliability. Thirdly, the 3-item X11, X12, X13, X14, X15and X16 is Responsiveness. Similarly, these items X17, X18, X19, X20, and X21 were gathered in the factor four and named as Communication. The group X22, X23, X24, and X25 was named as Security.

Table 3. Rotated component matrix for the final step

Statements	Components and factor loadings
Tangible	
X1 Good decoration and tidiness	.823
X2 Made by materials that are friendly with the environment	.784
X4 ATM locations are suitable	.752
X3 The quality of notes are good	.746
X6 ATM has modern and easy to use I-technique	.584
X5 Cameras, video recorder, alarm, light are in good conditions	.583
Reliability	
X7 Time savings, 24h/24h	.829
X8 Query response, timely action on request are easy to understand	.802
Responsiveness	
X12 Express prompt card delivery and services	.822

X13 Personnel tries to understand customer's problems	.773
X11 Good cooperation with call center	.630
X15 Customers don't wait for long time to talk to customer services	.822
X14 Personnel makes effort to resolve customers' problems	.773
X16 Providing prompt answers to customers' questions	.630
Security	
X24 Creativity and innovation are always supported	.778
X22 Handling to re-issue card when lost or broken	.757
X23 Resolve customers' problem well	.630
X25 Boots have secure, comfortable and private space	.599
Communication	
X19 Giving customers individual attention	.839
X18 Recognizing regular customers in later call	.792
X17 Answering the call with soft voice	.754
X21 Knowledgeable and friendly communication	.848
X20 Personnel are courteous and polite	.605

4.2 Correlation Analysis

In this section, researcher used correlation analysis to measure the relationship between each factor and job satisfaction of customers who are using banking service in Ho Chi Minh city, Vietnam. A strong or high correlation means that two or more factors have a strong relationship with overall satisfaction while a weak or low correlation means that the factors are hardly related.

Correlation coefficients can range from -1.00 to +1.00. The value of -1.00 represents a negative correlation while a value of +1.00 represents a perfect positive correlation. A value of 0.00 indicates that there is no relationship among the factors being tested (Fabrigar, 1999).

The bivariate correlation procedure is applied to analyze the relation between dependent variable overall satisfaction and two independent variables Assurance and Security. In the Table 4(a), correlation matrix supports all hypothesized positive relationship among these variables with high statistical significant. Tangible is found to be significantly and positive correlated with customer satisfaction (correlation coefficient or "r"= 0.779). Reliability is found to be significantly and positive correlated with customer satisfaction (correlation coefficient or "r"= 0.438). Responsiveness is found to be significantly and negative correlated with customer satisfaction (correlation coefficient or "r"= -.174). Communication is found to be significantly and positive correlated with customer satisfaction (correlation coefficient or "r"= 0.338). Security is found to be significantly and positive correlated with teacher satisfaction (correlation coefficient or "r"= 0.410).

Generally speaking, we want to test whether explanatory variable had a positive (or negative) effect on explained variable using regression analysis. Correlation analysis is related in the sense that both deal with relationships among variables. The correlation coefficient is a measure of linear association between two variables. It does not seem reasonable that this study conclude Tangible, Reliability, Communication and Security have a positive effect on customer satisfaction and Responsiveness has a negative effect on customer satisfaction.

Table 4(a). Correlations analysis for five factor and satisfaction

Factor	Pearson Correlation	Sig.(2-tailed)	N
Tangible	.779	.000	400
Reliability	.438	.000	400
Responsiveness	-.174	.014	400
Communication	.338	.000	400
Security	.410	.000	400
Overall Satisfaction	1		400

4.3 Multiple Linear Regressions

The objective of multiple regression analysis is to predict the changes in the dependent variable in response to changes in the independent variables. This objective is most often achieved through the statistical rule of least squares. Whenever the researcher is interested in predicting the amount or magnitude of the dependent variable,

multiple regressions is useful. For example, monthly expenditure on dining out (dependent variable) might be predicted from information regarding a family's income, its size, and the age of the head of household (independent variable).

The research's objective is to predict the changes of general customer satisfaction (dependent variable) in the relationship with Tangible, Reliability, Responsiveness, Communication and Security (independent variable). In detail, general satisfaction level will be predicted from information regarding inside factors: Tangible, Reliability, Responsiveness, Communication and Security.

In this section, by using multiple linear regressions the researcher selects one single dependent value, named as the overall customer satisfaction and five independent values, named as Tangible, Reliability, Responsiveness, Communication and Security to make a prediction.

Table 4(b). Model summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
					R Square Change	F Change	df1	df2	Sig. F Change
1	.797a	.636	.630	.502	.636	113.976	3	196	.000

Predictors: (Constant), Tangible, Reliability, Responsiveness, Communication and Security.

Dependent Variable: Overall Customer Satisfaction.

SPSS will generate quite a few tables in its results section for a linear regression. In this session, we are going to look at the important tables. The first table of interest is the *Model Summary* table (Table 4(b)). This table provides the R and R2 value. The R value is 0.796, which represents the simple correlation and, therefore, indicates a high degree of correlation. The R2 value indicates how much of the dependent variable, overall satisfaction of customers, can be explained by the independent variable, Tangible, Reliability, Responsiveness, Communication and Security. In this case, 63.6% can be explained, which is very large.

Note: In statistics, the coefficient of determination R2 is used in the context of statistical models whose main purpose is the prediction of future outcomes on the basis of other related information. R2 is most often seen as a number between 0 and 1.0, used to describe how well a regression line fits a set of data. An R2 near 1.0 indicates that a regression line fits the data well, while an R2 closer to 0 indicates a regression line does not fit the data very well. The coefficient of determination (R2= 0.63) shown in Table 4(b) indicates that our regression line fits the data.

The next table is the *ANOVA* table. This table indicates that the regression model predicts the outcome variable significantly well. How do we know this? Look at the "Regression" row and go to the *Sig.* column. This indicates the statistical significance of the regression model that was applied. Here, *P*< 0.0005 which is less than 0.05 and indicates that, overall, the model applied is significantly good enough in predicting the outcome variable (see Table 4(c)).

Table 4(c). ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	86.149	5	17.230	67.875	.000a
	Residual	49.246	194	.254		
	Total	135.395	199			

Predictors: (Constant), Security, Responsiveness, Reliability, Communication, Tangible.

The regression output, reproduced in Table 5 shows that Communication and Security factors are not significant (sig >5%). These variables barely fail to reach significance.

Table 5. Predictors_1 coefficients

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.680	.305	--	2.225	.016
Tangible	.163	.013	.711	12.854	.000
Reliability	.083	.026	.155	3.233	.001
Responsiveness	-.021	.010	-.097	-2.200	.029
Communication	-.010	.018	-.027	-.536	.592
Security	.006	.017	-.017	.337	.737

Those are one by one removed from the regression model and the final output is shown in table 6.

(1) All the explanatory variables are statistically significant with the significant index < 0.05.

(2) All has positive coefficients, which mean that tangible, reliability, and responsiveness have positive correlations with customer satisfaction.

(3) Standardized Coefficients of Tangible, Reliability, and Responsiveness are 0.707, 0.156, -.099 respectively. These indexes indicate that Tangible factor plays the most important role in making customers satisfied. Besides, Reliability occupied the second position and Responsiveness with Standardized Coefficients equals to negative value (-.099) is the factor that makes customers dissatisfied.

Table 6. Predictors_2 coefficients

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.696	.287	--	2.422	.016
Tangible	.162	.011	.707	14.962	.000
Reliability	.084	.025	.156	3.321	.001
Responsiveness	-.021	.009	-.099	-2.287	.023

Dependent Variable: General Satisfaction of Customers.

• What is the un-standardized regression equation?

Overall Satisfaction = 0.696 + 0.162 Tangible + 0.084 Reliability (-0.021) Responsiveness.

• Which predictors are statistically significant? Tangible, Reliability, Responsiveness.

The table above, *Coefficients*, provides us with information on each predictor variable. This provides us with the information necessary to predict overall satisfaction of customers from Tangible, Reliability, and Responsiveness. We can see that both the constant and Tangible, Reliability, and Responsiveness contribute significantly to the model (by looking at the **Sig.** column). By looking at the **B** column under the *Un-standardized Coefficients* column we can present the regression equation as: Overall Satisfaction = 0.696 + 0.162 Tangible + 0.084 Reliability (-0.021) Responsiveness.

5. Discussion and Solution

In this study, the author examined satisfaction with customers using banking service through multilevel analyses of the survey conducted in Ho Chi Minh City, Vietnam. Thus, this study aims (1) to know the practical situation of how customers are using payment cards, (2) to examine which factors are determinants affecting the satisfaction of customers in terms of self-services banking system, and (3) to analyze individual-level variables as to the influence on level of satisfaction.

The findings show that while the factors of tangible benefits and reliability have significantly positive influence on customer satisfaction, the factor of responsiveness shows significant dissatisfaction. In addition, customer satisfaction varied with their income level and educational background. These factors can be discussed in depth and detail for managerial implications. Therefore, this study may give an insight into improving service quality in areas of reliability, responsiveness and tangibles for the enhancement of customer satisfaction.

5.1 Customized Services with Tangible Benefits

Customized services are the services when you need any service personalized to your intent. In general, banks like other manufacturing companies would like to provide an interactive service customization model to support individual service offering for customers. In other words, companies with customized products and services offer products and services customized for their customers. The technology-based self-services are often a solution-based business customized to the private equity separate account needs for their clients. On top of that, bank networking make every attempt to employ mass customization, like in marketing, manufacturing, etc., coupled with the use of flexible computer-aided systems to produce custom output. This is because a tremendous increase in variety and customization does not cause a corresponding increase in costs.

For a firm, the tangible benefits may include the labour costs reduction, the equipment expense reduction, the space and overhead costs reduction, the inventory costs reduction, the bad debts reduction, or sales increase. These tangible benefits can be transferred to customers as customers' tangible benefits. For instance, customers can get the benefits if the expense of inter-bank money or transaction transfer is reduced or eliminated. Another example is that if the Internet is very secure, customers may make the transactions fast with convenience and free of charge.

In this study, customers expect to receive tangible improvements in the suitability of products and services customized to their needs. Thus, as to large retail banks, they should offer quality service delivery of personalization and flexibility customers want, and also lower costs through mass customization to generate more sustainable profits.

To achieve the goal of customized services with tangible benefits, it is very competitive for the retail bank by the use of innovative and cutting-edge technology to deliver quality service. It is exceptionally competitive since the smart phone started to be popular. However, this can help to maintain intimacy at a greater distance as customers move towards Internet, networking, or digital banking with greater self-services.

Customers prefer online channels with simple transactions, but they also demand high-quality, friendly or comfortable, and secure personal service, especially the more complex transactions with guidance. They require ambient environments of physical facilities, equipment, personnel, and communication materials. They may also be very interested in modern facilities and locations, for instance, ATM and locations. Thus, bank owners should examine ATM and banking services frequently to make improvements.

5.2 Reliability-More Accuracy and Flexibility with Lowest Costs

In present research, reliability is found as one of the most important factors from the banking services. Actually, since most customers are concerned about the reliability of virtual service providers, banking services providers should take more care about it. Employees in the front desk or internet banking continuously play an important and irreplaceable role behind banking service.

For physical banking, customers always focus on employees' performance. Therefore, bank owners has to pay more attention to staffs' working performance and give more chances of training and promotion for them in order to instill customers' confidence in banking services.

For Internet or other networking banking, customers use computers or make transaction at ATM. It is important for the bank to deal with business both online and offline. It's recommended that technical function and accurate record should be carefully noticed by the banking service providers.

Banks can also develop flexible loyalty program due to the fact that most customers are attracted by financial rewards. Although costly, such rewards offer huge potential benefits in loyalty and advocacy. Banks can embrace programs for affinity groups and let customers choose rewards attracting to them.

5.3 Responsiveness: Friendly Attitudes and Prompt Services

To have a better performance for a bank, the responsiveness is an important factor which necessitates friendly attitudes and prompt services shown in this survey. Thus, employees at front desk have to be friendly, and actively and positively responsive to customers' needs or questions. In so doing, if customers' expectation is met, their impression of the services may increase the satisfaction. In addition, prompt services are also essential that may streamline the services and then increase the level of customers' satisfaction.

Accordingly, bank owners should improve both physical banking service and internet banking service to give customers the best prompt services. Besides that, applying technology in banking service is a good way to enhance service responsiveness. Since the internet handles matters faster and easier in transaction for both customers and service providers, Internet banking has improved customers service better, especially for service

responsiveness. The factor of responsiveness can be characterized by the following services using as an example.

(1)   The promptness of card delivery and services.

(2)   The understanding of customers' problems attempted by banking personnel.

(3)   The best way to resolve customers' problem made banking personnel.

(4)   The reduction of waiting time to satisfy customer needs.

(5)   The promptness of answering customers' questions.

Therefore, it's very important for managers to take specific factors into close consideration, in that the service quality may affect customers' satisfaction performed by banks in Ho Chi Minh City, Vietnam. Managers must explore the most important factors in service quality and then deal with them properly. More importantly, the key five factors of tangible, reliability, responsiveness, assurance and empathy may have the combined effect on customer satisfaction. Hence, managers can manage well their resources to improve the overall perceived service quality in the banking sector.

6. Contributions

The researcher did the investigation of customer satisfaction in the case of banking services in Ho Chi Minh City, Vietnam. The results indicate that customer satisfaction and service quality can be hugely improved through self-services technology. In the current study, the five determinant factors in banking service quality are tangible, reliability, responsiveness, assurance and empathy.

7. Limitations and Future Research

This research was designed to test hypotheses of only five factors of service quality related to customer satisfaction. However, there are other variables that may have effect on customer satisfaction. Future research can test them for the generalization.

Another limitation lies in the fact that the data were collected in a single urban city in which the number of respondents is restricted. Thus, the sample size can be larger in the future research and banking services need to be across more Vietnamese and foreign banks.

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Diversification as a Corporate Strategy and Its Effect on Firm Performance: A Study of Zimbabwean Listed Conglomerates in the Food and Beverages Sector

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Abstract

Portfolio diversification in capital markets is an accepted investment strategy. On the other hand corporate diversification has drawn many opponents especially the agency theorists who argue that executives must not diversify on behalf of share holders. Diversification is a strategic option used by many managers to improve their firm's performance. While extensive literature investigates the diversification performance linkage, little agreements exist concerning the nature of this relationship. Both theoretical and empirical disagreements abound as the extensive research has neither reached a consensus nor any interpretable and acceptable findings. This paper looked at diversification as a corporate strategy and its effect on firm performance using Conglomerates in the Food and Beverages Sector listed on the ZSE. The study used a combination of primary and secondary data. Primary data was collected through interviews while secondary data were gathered from financial statements and management accounts. Data was analyzed using SPSS computer package. Three competing models were derived from literature (the linear model, Inverted U model and Intermediate model) and these were empirically assessed and tested.

Keywords: diversification, performance, corporate strategy

1. Introduction

In the last two decades one of the most popular corporate strategies adopted across the globe has been that of diversification. The phenomenon was popular in the United States and Europe in the late 1960s to 1980s where large corporations sought to expand their empires through acquisitions and mergers. Despite diversification almost becoming a dominant strategy globally, the arguments and questions about the value of this strategic option have never stopped. According to Hitt and Hoskisson (2005), the latest trend across the globe is for companies to disinvest and to concentrate on core businesses. Johnson et al. (2006) suggest that the present trend towards narrower diversification has been driven by a growing preference to gear diversification around creating strong competitive positions in few well selected industries as opposed to scattering corporate investments across many industries. This latest development arose mainly as a result of many companies making strategic mistakes such as making acquisitions in new fields where value is not added to group performance or there are no operating synergies as stated by Dos Santos et al. (2008). The phenomenon has since spread to Zimbabwe as conglomerates have restructured to raise profits and unlock shareholder value.

The research domain that attempts to study the relationship between diversification and performance has not yet reached definitive and interpretable findings to determine whether diversification strategy creates or destroys value despite the substantial number of empirical studies (Santalo & Beccera, 2008). In finance, the case for diversification is anchored in Markowitz's portfolio theory that risk is reduced by adding to the portfolio, assets with unrelated cash flows or returns. Other researchers like Shliefer and Vishny (2006) have argued that while investors should diversify, firms should not unless synergies can be exploited. Thus, it appears that diversification may be a bad strategy in the long run unless the various businesses in the corporate portfolio can obtain certain synergies and gain competitive advantage (Collins & Montgomery, 2008). The agency theory says that managers can pursue their own interests through diversification which are not always in line with their

shareholders. This complicates the case for diversification. It raises the debate of whom between the investor and corporate executive should diversify.

According to Thompson and Strickland (2006), *"Diversification is a collection of individual businesses."* Diversification also allows companies to compete in an array of different businesses that may or may not be related. Two seemingly irreconcilable facts motivate this study, one diversification continues to be an important strategy for corporate growth in the world over, Africa and in Zimbabwe and two while Management and Marketing disciplines favour related diversification, Finance makes a strong case against corporate diversification as pointed out by Brealey and Myers (2007, p. 946) when they argue that *"diversification is easier and cheaper for the stockholder than for the corporation"*.

Since the late 1990s and the early 2000s the desire for repositioning prompted listed companies in Zimbabwe like Delta, TA holdings and Innscor Africa to adopt diversification as a corporate strategy leading to the birth of Zimbabwean conglomerates. Now, diversification especially conglomeration has become a popular practice for Zimbabwe's firms to grow with the likes of Econet being the recent culprits acquiring TN Bank. The research sought to establish why companies like Innscor Africa Limited and Delta corporation used diversification as a corporate strategy, when finance scholars such as Barney (2006) argue that *"companies should stick to their core competencies"* suggesting that investors should diversify on their own and why some of them later unbundled, with the likes of Delta corporation spinning four of its subsidiaries around 2001 which included OK Zimbabwe, Pelhams and Zimsun hotels. The company later on went to acquire 29.8% of listed African Distillers, a related industry firm and then later 41.9% of listed Ariston Holdings- an unrelated business with interests in agriculture, http://www.zimbabwe-stock-exchange.com/listed-company/dlta/ (22/08/13:14:00).

Was the unbundling motivated by the costs of diversification exceeding the benefits, was it necessitated by a reduction in corporate performance (conglomerate discount as described by Ozbas and Scharfstein (2010) or some other factors? In making further acquisitions after unbundling, were the executives recreating the old empire or safeguarding shareholders interests by diversifying? What impact did these strategies have on corporate performance and shareholder value? The study sought to identify all forms of diversification employed by these conglomerates and evaluate their effects on firm performance.

2. Literature Review

2.1 Introduction

There is still disagreement as to whether diversification increases or reduces performance, whether it causes a conglomerate premium or a discount respectively. The relationship is still controversial, contradictory and inconclusive. Questions still persist as to whether diversification strategy is universally profitable or universally unprofitable. Thus the issue whether diversification improves or worsens firm performance is still worthy of further research such as the one undertaken in this study. Besides, very little exists in terms of research in the area of diversification and its impact on firm performance in Africa in general and Zimbabwe in particular. The study sought to investigate diversification as a corporate strategy and examining the relationship between diversification strategy and firm performance using Zimbabwean conglomerates in the food and beverages sector by asking a question initially posed by Villalonga (2004a) on the effect of diversification on firm performance, Diversification discount or premium? In the words of Santalo and Becerra (2009), the diversification–performance linkage is worthy of research since value creation has been put at the top of the objectives which should guide firm strategy.

It is accepted that in developed economies investors can independently diversify their portfolios because more efficient capital markets exist. As this is not the case in most of African states, the understanding of how internal capital markets of diversified firms work is very important for policy makers as this would also assist them deter anti-competitive practices by big firms.

2.2 When to Diversify and Motives for Diversifying?

2.2.1 The Concept of Diversification

The concept of diversification is yet to be clearly defined and there is no consensus on the precise definition among researchers. Apart from the definitions by scholars like (Turner, 2005; Thompson & Strickland, 2006; Aggarwal & Samwick, 2003), Johnson et al. (2006) says it's a collection of businesses under one corporate umbrella. Lending support to all the various definitions, for this research diversification is defined in a broad sense as expanding business fields either to new markets, new products or both while retaining strong core businesses.

Santalo and Becerra (2008) allude to the fact that a company can diversify when its cash flows become

increasingly uncertain. Turner (2005) suggests that when the core business no longer offers the investor the acceptable returns for the risk taken, there is need to diversify. In the words of Barney (2006) if the core business no longer offers growth opportunities, room for increasing sales and profitability then business should diversify.

2.3 Diversification Strategies

Diversification strategies are used to expand the firm's operations by adding markets, products, services or stages or production to the existing business. Kotler (2006) identifies three types of diversification strategies namely, concentric, horizontal and conglomerate. "Horizontal Diversification strategy" occurs where a company seeks new products that could appeal to its current customers even though the new products are technologically unrelated. "Conglomerate Diversification Strategy" takes place where a company seeks new businesses that have no relationship with their present business or market operations (Thompson & Strickland, 2006).

Collins and Montgomery (2005) divided diversification into two types related and unrelated diversification. The two are analyzed in-depth, considering their merits and demerits whereas Emms and Kale (2006) describes the various ways and strategies adopted by diversifying companies as modes of diversification.

Collins and Montgomery (2008) believe that related diversification involves building shareholder value by capturing cross business strategic fits. The combining of resources creates new competitive strengths and capabilities (BCG, 2006). Related diversification may involve use of common sales force to call on customers, advertising related products together, use of same brand names and joint delivery. On the other hand, Thompson and Strickland (2006) believe that many companies decide to diversify into any industry or business that has good profit opportunities. Johnson et al. (2006) noted that in most cases companies that pursue unrelated diversification nearly always enter new businesses by acquiring an established company rather than by forming a start up subsidiary. The basis for this strategy is that, growth by acquisition translates into enhanced shareholder value faster and the payback period is quicker.

2.4 Risks and Rewards of Diversification as a Strategy

The corporate managers bring both a cost to the combined organizations as well as the opportunity to manage the combined resources of the different businesses (Wan, 2011). According to Collins & Montgomery (2005), a more meaningful approach is to analyse the costs (risks) and benefits (rewards) under the strategies of related and unrelated diversification.

Hoechle et al. (2009) argues that the major advantages of related diversification are that it leads to operational synergies, which in turn develop into long-term competitive advantage. Johnson et al. (2006) argue that most of the advantages of related diversification stem from the fact that it allows the company to enjoy economies of scope. Despite the above advantages related diversification can still fail to reap the originally predicted returns and benefits due to several shortcomings and demerits. Gary (2005) allude to the fact that related diversification analysis at times underestimates the softer issues like change management, and may tend to overestimate synergistic gains.

The Boston Consulting Group (BCG) (2006), have noted that business risk is scattered over a set of diverse industries and one can spread risk by spreading businesses with totally different technologies, competitive forces, market features and customer bases. This in line with the Markowitz portfolio theory in finance which suggests that diversification reduces a firm's exposure to cyclical and seasonal uncertainties and risks. Dos Santos et al. (2008) also pointed out that a company's financial resources can be employed to maximum advantage by investing in whatever businesses offering the best profit prospects.

Campbell, Goold and Alexander (2006) identify that there is a big demand on corporate level management to make sound decisions regarding fundamentally different businesses operating in different industries and competitive environments. This is often difficult to achieve where skills are not readily available which is true of the current Zimbabwean "brain drain" phenomenon. This was also echoed by Pindyck and Rubinfeld (2005). On the same line of thought Shliefer and Vishny (2006) argue that corporate managers have to be shrewd and talented to run many different businesses.

2.5 The Diversification- Performance Relationship

The effect of corporate diversification on firm performance has been widely studied (Dimitrov & Tice, 2006; Yan et al., 2010; Hoechle et al., 2009; Hoskisson & Peng, 2005; Wan, 2011; Wright et al., 2005 and others). While this topic is rich in studies many researchers concurred on the lack of consensus on the precise nature of the relationship between diversification and firm performance. Some studies have shown that diversification improves profitability over time citing a positive relationship (Yan et al., 2010; Hoskisson & Peng, 2005; Wan, 2011), whereas others have demonstrated negative relationship and that diversification decreases performance

(Ozbas & Scharsfstein, 2010; Maksmovic & Phillip, 2007). Still others have shown that diversification and performance linkage depends on business cycle. Santalo and Becerra (2004) explain conceptually and provide empirical evidence that no relationship exists (positive, negative or even quadratic) between diversification and firm performance.

Santalo and Becerra (2008), concurring with Stowe and Xing (2006), broadly conclude, (a) the empirical evidence is inconclusive (b) models perspectives and results differ based on the disciplinary perspective chosen by the researcher and (c) the relationship between diversification and performance is complex and is affected by intervening and contingent variables such as related versus unrelated diversification, and mode of diversification.

In the words of Daud, Salamudin and Ahmad (2009), studies in the areas have tended to provide inconclusive results due to inconsistent data, different time frames, different performance measures and moderate variables. Mackey (2006) argues that the contradictory results are related to; different timeframes, various measures of profitability and different measures of diversification. Andreou and Louca (2010) assert that the confusion is partly methodological and partly theoretical. However, the diversification- performance puzzle was summarized in the theoretical models outlined below as the theoretical framework is reviewed.

2.6 Diversification and Shareholder Value

The impact of diversification on shareholder value is mixed. Academics, consultants, the public and financial community have different views. Some studies such as (Villalonga, 2004a, 2004b; Dos Santos, 2008; Doukas & Kan, 2006; Santalo & Becerra, 2008) have been aimed at establishing whether diversification leads to shareholder value destruction or improvement that is, either creating a discount or a premium. Some studies have proved that high levels of diversification increase profitability and shareholder value (Dimitrov & Tice, 2006; Yan et al., 2010; Kuppuswamy & Villalonga, 2010). Villalonga (2004b) estimated the value effect of diversification by matching diversifying and single segment firms on their propensity score and found out that diversification does not destroy shareholder value. In the same direction Doukas and Kan (2006) pointed out that segments acquired by diversifying firms in most cases already traded at a discount before acquisition and hence their acquisition will improve performance, thus refuting the post acquisition negative relationship between diversification and performance in terms of profitability and shareholder value. Others have also shown that high levels of diversification are detrimental to profitability and on average destroy shareholder value for diversifiers pointing to the fact that refocusing generates positive shareholder returns. (Tongli et al., 2005). Masulis et al. (2007) found that firm characteristics which make firms diversify might also cause them to be discounted.

2.6.1 Corporate Diversification Destroys Shareholder Value

There is a school of thought among academic researchers, consultants, and investment bankers that diversified firms destroy value (Ozbas & Scharfstein, 2010; Hoechle et al., 2009). The evidence that supports this conclusion comes from a variety of sources. Diversified firms tend to have a lower Tobin's Q; they trade at a discount of up to 15%, when compared to the value of a portfolio of stand-alone firms; they face an increased likelihood of being broken up through reorganization that varies directly with the size of the discount; and the stock market tends to react favourably to increases in refocus (Collins & Montgomery, 2008; Masulis et al., 2007; Doukas & Kan 2006; Stulz et al., 2007). In line with this school of thought Breadley et al argue that companies should stick to their core competencies and let shareholders diversify on their own as diversification is costly rather than beneficial for the corporation. The author states that poor multidivisional performance destroys value. Doukas and Kan (2006), point out the problem of capital misallocation in diversified firms as the one of the reasons for poor performance.

2.6.2 Corporate Diversification Creates Shareholder Value

Despite researchers like Ozbas and Scharfstein (2010) concluding that diversification is not a successful path to higher performance because the value of the diversified firm is less than the sum by an average discount factor of 13–15%, others like Akbulut and Matsusaka (2010), Kuppuswamy and Villalonga (2010), Dastidar (2009) argue against the diversification discount and point to a premium. The researchers found empirical evidence that diversification might be a value enhancing strategy. Dimitrov and Tice (2006) assert that there is no diversification discount and in fact diversified firms trade at a significant premium.

In the words of Yan et al. (2009), "*corporate diversification becomes more efficient and value adding where capital markets are relatively inefficient and various segments of a diversified firm would be financially constrained as single segments hence diversified firms would create shareholder value as compared to single segments*". Kuppuswamy and Villalonga (2010) find that relative value of diversified firms increase significantly. Akbulut and Matsusaka (2010) concur when they point out that stock markets react positively to diversifying

acquisitions. Dos Santos et al. (2008) found evidence that US acquirer firms increase in value in the two years surrounding the acquisition. Kiymaz (2006) found that both divesting and acquiring firms experience a statistically significant wealth gains during sell off announcements. Santalo and Becerra (2008) argue that the effects of diversification on firm performance are not homogenous but rather heterogenous across industries. Diversified firms might be valued at a discount in some industries, but trade at a premium in others.

Finally, recent works (Stowe & Xing, 2006; Emms & Kale, 2006; Kuppuswamy & Villalonga, 2010) have attempted to overcome such a discount/premium dichotomy and have come up with existence of moderating variables in the diversification–value relationship which can make some diversifiers create more value than others. Does diversification create value for firms? The answer here would seem to "it depends". It is observed that, even though discount seems to prevail in conglomerates, there are some cases where premiums are found (Santalo & Beccera 2008). As a consequence the debate has recently centered on seeking conditions under which diversification can result in a value-creating strategy (Mackey, 2012). In this vein, different moderating variables have been suggested, such as relatedness between segments, industry, period of analysis, geographical versus industrial diversification, diversity of growth opportunities or the diversification profile (Santalo & Becerra, 2008; Andreou & Louca, 2010; Stowe & Xing, 2006).

To summarize the above arguments on the diversification- value puzzle, on the positive side (value creation) diversified firms benefit more than single segment firms from an efficient internal capital market, from cheaper access to external sources of funds. In addition diversified firms follow a neoclassic value maximization model, searching for new growth opportunities, maximizing synergies across businesses, acquiring poor performing firms and improving the productivity of target companies through higher management capabilities. On the negative side (value destruction), empirical findings have shown its drawbacks, especially driven by agency arguments that divert funds from their best uses, by development of business segments lacking in potential synergies or because the firm is too big and becomes unmanageable.

3. Research Methodology

The study focused on the listed conglomerates in the food and beverages sector with operations in the ZSE. The study was limited to the period spanning 1999–2004, a six-year span that should be adequate in terms of following strategies and identifying trends. A shorter time span is desirable because strategic plans change overtime. A cross-sectional design was used and involves measuring a phenomenon at a point in time (Herrman, 2009). Short period surveys conducted by previous researchers among others (Daud et al., 2009; Syed & Rao, 2004) ranged from 4 to 6years. The justification being that, firms rarely maintain the same strategy over a long period of time. The period was also chosen for comparability of financial information purposes as it spans the period before the currency crisis deepened to witness the constant dropping of the zeros in the currency. This was also the time when these conglomerates diversified extensively.

Currently there are five companies in the food and beverages sector namely Delta Corporation, Innscor Africa, Dairiboard Zimbabwe, Colcom Holdings and National Foods (with the last two being subsidiaries of Innscor Africa). The last two were eliminated on the basis that they are part of Innscor and Dairiboard Zimbabwe was also eliminated because from 1997 the time it listed up to 2006 it was a focused company effectively leaving two companies that were considered representative of the conglomerates in the sector. Senior executives in the companies were the target population for interviews. The study used judgmental sampling for the in depth interviews by selecting 12 executives for the two groups and there was a 100% response rate.

Secondary data sources included published accounts, minutes of strategic meetings and board meetings, management accounts, monthly financial reports, internal audit reports and segment reports. The principal sources were Audited Annual Reports for the two companies. A number of artifacts and documentary sources were collected during the data gathering stage. These included Delta and Innscor publications, the Groups' public websites http://www.delta.co.zw/ (07/09/13:15:40) and www.innscorafrica.com/inn-Zimbabwe.html (07/09/13:16.04) respectively.

3.1 Measurement of Variables (Diversification and Performance)

Empirical studies on diversification and performance have used different measures to measure these two variables, diversification and performance (Santalo & Becerra, 2008; Dimitrov & Tice, 2006; Ozbas & Scharfstein, 2010). The study adopted some of these measures which have been successfully used by the previous researchers justifying the measurement methods used citing some of the reasons and suggestions made by previous researchers.

3.2 Diversification (Specialisation Ratio)

For this study Rumelt's Specialization Ratio was adopted and used. The study sought to classify the conglomerates into one of the three categories identified by Yan et al. (2009). The study used the data gathered on sales to classify the Company. For all the ten years under study the study sought to measure the average sales from the company's dominant business to see whether they are above 95% of total sales, lie between 95% and 70% of its total sales or fall below the 70% mark. This measure of diversification was adopted because of its advantages of easier calculation and understandability. Splitting diversification into related and unrelated diversification as advocated for by the entropy measure is cumbersome and difficult to calculate.

Yan et al. (2009) and Daud et al. (2009) used the Specialization Ratio (SR) to classify firms into three classes of diversification. Its logic reflects the importance of the firm's core product market to that of the rest of the firm.

Operationally, SR is a ratio of the firm's annual revenues from its largest discrete, product market activity to its total revenues. In the diversification literature, S.R has been one of the methods of choice for measuring diversification. It is easy to understand and calculate.

The Rumelt's Specialization ratio categorized companies as shown in Table 1 below:

Table 1. Specialisation ratio

SR Values	
Undiversified, Single Product Firms	SR ≥ 0.95
Moderately Diversified Firms	0.95 < SR ≤ 0.7
Highly Diversified Firms	SR < 0.7

Daud et al. (2009) Classified firms into three groups (1) Single product firms with SR> 0.95; (2) moderately diversified firms with SR values between 0,95 < SR< 0.7. This group includes dominant, relatedly diversified and unrelatedly diversified firms (3) the highly diversified category of firms have SR<0.7 and include conglomerates, relatedly constrained and relatedly linked firms. Yan et al. (2010) calls a firm moderately diversified if its sales from its dominant business lies between 95% and 70% of its total sales and he calls a firm highly diversified if the sales from its dominant business is below the 70% mark.

3.3 Performance

For the purpose of this research, key performance indicators such as turnover (sales), net profit, net assets, earnings per share, dividend per share and market price per share were analyzed to measure performance. Borrowing from Tongli etal (2005) and Daud et al. (2009), return on assets (ROA) and return on sales (ROS) were used to measure performance (especially as regards to profitability). Earnings per share, dividend per share and market price per share were used to address the effect of diversification on shareholder value together with market return. Daud et al. (2009)'s calculation of market return was adopted. Return on Assets is defined as net Income (Income available to ordinary shareholders divided by the book value of total assets.

$$\text{Return on Assets (ROA)} = \frac{\textit{Net Income after taxes but before extra ordinary items}}{\textit{Total Assets}}$$

To complement ROA, Daud et al. (2009) also like Tongli et al. (2005) used Market return as a proxy for market performance and this was calculated as share return and for this study Daud's calculation of market return (share return) was adopted as shown below.

$$\text{Share return} = \frac{SPn - Spi \; x \; 100}{Spi}$$

Share return = percentage Change of Share price over initial value;

SPi = Beginning of Year Share price;

SPn = End of Year Share Price.

Stowe and Xing (2006) argued that the use of different accounting measures of performance has led to ambiguous results since these are subject to manipulation prompting the authors to also adopt market measures as alternative proxy. Even though both measures may have limited capability to measure performance (accounting and market measures) at least using them together could capture almost all performance goals. According to Tongli et al. (2005), a single measure that satisfies all performance criteria is not available and multiple measures may be appropriate to establish the robustness of findings. Therefore the authors found it necessary to incorporate different measures to examine diversification and performance relationship.

Since accounting conventions make these variables unreliable, financial economists prefer market returns or discounted cash flows as performance measures. For consistency purposes Stowe and Xing (2006) used two accounting measures, ROE and ROA along with market return to measure performance. Daud et al. (2009) employed accounting measure of performance by using return on asset (ROA) as a proxy. According to Santalo and Becerra (2008), this ratio is under management control, even though it is used by practitioners and academics because it controls for differences in a firm's financial design and also because investors make investment decisions based on accounting numbers as better financial results lead to higher share prices. When assessing diversification- performance in India, Palepu (2009) used the same ratio.

Developing from previous studies as outlined above the study used accounting based measures, complementing these with market based measures such as share return as earlier mentioned to reduce the limitations of accounting based measures and for consistency with the works of previous researchers who argued that combining the two enhances reliability and validity of results. SPSS computer package was used to analyze some of the data and the findings are as follows.

4. Results

4.1 Effects of Diversification on Performance (Turnover, Profits, EPS, DPS)

This section focuses on the traditional economic measures used to analyze and examine company performance. The analysis covers an analysis of turnover, net profit before and after tax, earnings per share, net assets analysis, market price per share, ROA, ROS and a performance by sector analysis. The performance by sector analysis enables the reader to ascertain what the major contributors towards group profitability are and their direct link to the diversification strategies used.

According to Daud et al. (2009), turnover represents total sales of merchandise or services sold to customers. It indicates the level of business made in any one period. The performance of the individual groups that is Delta and Innscor is shown below in table 2.

Table 2. Average yearly turnover

Year	Value- $m's	%Growth
1999	7, 261	
2000	10, 995	51.43
2001	17,953	63.28
2002	40, 001	122.8
2003	120.166	200.58
2004	577, 444	381.61

Table 2 above shows that there is a positive and linear relationship between diversification and firm performance as measured by turnover.

4.2 Net Profit Before Tax Analysis 1999–2004

According to Tongli et al. (2005), net profit before tax shows the overall profitability of the company resulting from business activities. It is profit attributable before taxes are paid over to government. It is a measure of how attractive the business is. Once again this can only be attributable to a successful diversification strategy considering most acquisitions were done in the early 2000s. Indeed diversification is positively and linearly related to performance as shown by figureses in Table 3 below.

Table 3. Average yearly net profit before tax

Year	Value- $m's	%Growth
1999	471	
2000	641	36.1
2001	1, 233	92.36
2002	2, 746	122.71
2003	23, 915	770.09
2004	153, 781	599.95

Table 3 shows a growth in average net profits for the 6 years, this is in line with the growth in the net profits before tax of the 2 groups.

4.3 Earnings per Share (EPS) Analysis 1999–2004

According to the Brealey et al. (2007) earnings per share (EPS) is one of most widely used statistics employed by financial analysis. It is particularly useful in comparing profitability of enterprises over time. The ratio is an expression of earnings attributable in cents divided by average number of shares. This shows an increase in earnings per share for the 6 years per each group. This growth could be attributable to the growth in earnings due to the benefits of diversification. Table 4 below outlines the average EPS between 1999 and 2004.

Table 4. Average Earnings per Share (EPS) analysis 1999–2004

Year	Value- Cents	%Growth
1999	57	
2000	77	35.08
2001	148	92.2
2002	472	218.92
2003	2.844	502.54
2004	17. 018	498.38

A review of the Average EPS indicates a steady performance by the conglomerates ultimately leading to an increase in shareholder value.

4.4 Dividend per Share (DPS) Analysis 1999–2004

Everingham and Hopkins (2005) view dividends per share (DPS) as another useful statistic employed by financial analysis. It is particularly useful in comparing dividends paid to investors of the business over time against other enterprises. The ratio is an expression of dividends in cents divided by average number of shares. Table 5 below shows Average DPS between 1999 and 2004 for the 2 companies.

Table 5. Average DPS analysis 1999–2004

Year	Value- Cents	%Growth
1999	220	
2000	66	0
2001	800	0
2002	2,410	1112
2003	25,350	201.25
2004	1,300,000	5028.34

Source: Innscor and Delta's Annual Reports.

Table 5 above shows an average growth in dividend per share from 220 cents from 1999 to 1 300 000 cents in 2004. This is in agreement with the individual company DPS. Dividend per share is a measure of shareholder value and therefore for the years 2002 to 2004 the shareholders are earning a substantial return on their investment. This is in line with the arguments by Kuppswang and Villalonga (2010) who argued in support of diversification creating shareholder value.

4.5 Net Assets Analysis 1999–2004

This ratio is not frequently used by many companies. It represents the total value of assets as a percentage of total number of shares issued (Stowe & Xing 2006). The ratio shows the value of assets owned by the company per share. Ideally this shows potential investors how the company is growing in terms of assets. An analysis of Average Net Assets from 1999 and 2004 for the two groups is shown in Table 6 below:

Table 6. Average net assets analysis 1999–2004

Year	Value- Cents	%Growth
1999	450	
2000	664	48
2001	1,062	60
2002	2,217	108.75
2003	13,680	517.05
2004	82,616	503.91

Source: Innscor and Delta's Annual Reports.

From table 6 above, it was noted that average assets grew from $450 million in 1999 to $83 billion in 2004. This reflects the growth in net assets for the individual companies (Innscor's net assets grew from $467 million in 1999 to $150 billion in 2004 and Delta's assets grew from $433 million to $15 billion). This could be attributed to the acquisitions made during this period for example Innscor increases its share holding in National Foods and Colcom around 2003 and Delta acquires Dawning Properties around the same period.

Return on assets and return on sales

The return on sales and return on assets point to a positive linear diversification-performance linkage. In this case as the conglomerates acquire more businesses between 2000 and 2004 performance improves tremendously as shown below.

There was a tremendous growth in the 2 ratios from 32% to 80% and 30% to 47.5% for ROS and ROA respectively from 1999 to 2004. This could be attributable to the growth in net profits due to the benefits of diversification and also due to the hyperinflationary environment that prevailed in Zimbabwe at that time. The above findings could be graphically presented depicted by table 7 below:

Table 7. Yearly ROS and ROA

Year	ROS %	ROA %
1999	32	30
2000	34	35
2001	38	40
2002	75	43
2003	82	45
2004	80	47.5

Source: Delta and Innscor Annual Reports.

The above table shows a positive and linear growth in the 2 ratios for the years 1999 to 2004. This is in line with the arguments by Palich et al. (2000) who suggested the linear model of the diversification–performance relationship. As the groups acquired different companies in the early 2000s performance as measured by the 2 ratios continuously increased.

4.6 Market Price per Share Analysis 1999–2004

Schliefer and Vishny (2006) view market price per share as the price that a willing seller and willing buyer are agreeable to trade. Since the conglomerates are listed on the stock exchange it is the quoted price for the share. Daud et al. (2009) views this as the best measure for firm performance especially shareholder value since it is the price determined by market perceptions and management have no control over. The authors also recommend market return as a measure of firm performance. Tabled in 8 below are the average market prices per share from 1999 to 2004.

Table 8. Market price per share analysis 1999–2004

Year	Value- Cents	%Growth
1999	97.77	
2000	95.015	2.81
2001	212.505	123.65
2002	715.03	236.4
2003	2,249,410	214.59
2004	58,009,980	2.478.89

The high average share price in 2004 was primarily attributable mainly to the Bull Run experienced on the ZSE during this period. It was also a result of positive financial results, positive assets growth, high dividend payouts and an aggressive diversification strategy. The percentage growth according to Daud et al. (2009) is the share return (see chapter three for calculation of share return). The spread of returns clearly shows the positive contribution the diversification strategy has had on the groups' results. The conglomerates managed to successfully combine both related and unrelated units in order to improve their turnovers, gross profits, net profits, assets base, and earnings per share, dividend per share and market price per share.

4.7 Multiple Linear Regression Analysis

Multiple linear regression was used in order to check on the relationship between growth (as it was assumed that it was due to diversification considering that there was tremendous growth between 2000 and 2004, the period when most acquisitions were made) and the other factors which include earnings per share (EPS), net profit (NP), return on assets (ROA) and return on sales (ROS). Statistical Package for Social Scientists (SPSS) was used in the analysis of the data and the results found were as shown in Table 9 below:

Table 9. Model summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.672[a]	0.451	0.36	26.03316

a: Predictors: (Constant), ROS, ROA, NP, EPS.

The correlation (under the R) is .672. Thus, there is a positive, correlation between growth and the independent variables which are ROS, ROA, NP and EPS. The table shows that about 36% of the change in growth was determined by the independent variables.

An Analysis of Variance (ANOVA) was done in order to check on the significance of the model.

Relationship testing:

H0: The coefficients are equal to zero i.e. they are not significant;

H1: The coefficients are different from zero, i.e. they are significant;

The results are shown in Table 10 below:

Table 10. ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	13365.62	4	3341.405	4.93	0.005[a]
Residual	16265.411	24	677.725		
Total	29631.031	28			

a: Predictors: (Constant), ROS, ROA, NP, EPS;

b: Dependent Variable: Growth.

The ANOVA table above shows that the F-value is 4.930 and the p-value is 0.005 which is very much less than 0.05 (95% level of significance), hence we reject the null hypothesis and conclude that the regression coefficients are significantly different from zero. This means that there is a linear relationship between growth

and the independent variables.

The coefficient Table 11 below provides partial coefficients for the constant, EPS, NP, ROA and ROS. All the coefficients are significant at 95% confidence level since their p-values (sig.) are less than 0.05.

Table 11. Coefficients[a]

| Model | Unstandardised Coefficients | | Standardised Coefficients | | |
	B	Std. Error	B	t	sig
(Constant)	104.943	6.987		15.02	0
EPS	0.001	0	0.382	1.744	0.04
NP	0.002	0.002	0.223	1.404	0.017
ROA	-1.425	1.045	-0.223	-1.364	0.042
ROS	1.031	1.267	0.181	0.813	0.024

a: Depended Variable: Growth.

Hence the regression model is given by

$$Growth = 104.943 + 0.001*EPS + 0.002*NP – 1.425*ROA + 1.031*ROS$$

From the model we note that only the coefficient of ROA is negative which shows that there is a positive linear relationship between ROS, EPS, NP and Growth, the confirming linear and positive relationship between diversification and performance hence we confirm the positive linear relationship between diversification and firm performance as argued by Palich et al. (2000) and Miller (2006) in the linear model.

When focusing on the market based measures of performance (market price per share and share return), diversification also seems to be positive confirming the linearity and positivity of the diversification-performance linkage. This is contrary to Hitt (2006) who argued that expanded diversification leads to decreased performance as it increases costs of administering and governing and these outweigh the benefits. The authors also argued that firms diversifying outside their core business or competencies inherit increased costs that interfere with performance and this is contrary to the case of Innscor where unrelated businesses like Niloticus have been a tremendous success leading to its listing in the Zimbabwe stock Exchange as a separate entity delinked from the Group in 2011 as Pandenga holdings. The chairman of the Group had this to say in 2010 financial statements "Niloticus, the crocodile ranching operation could capitalize on its achievements to date by functioning as a stand -alone entity with renewed and specific focus".

5. Discussion

5.1 Motives for Diversification

The study also found that the conglomerates' desire to diversify was driven by the synergistic, growth, resource based and financial motives. Economies of scale and scope, shared skills, resources and competencies and risk reduction were some of the motives behind the adoption of diversification. This is in line with the arguments by Santalo and Beccera (2009).

5.2 Diversification Strategies Adopted by the Zimbabwean Conglomerates

The research established that the conglomerates employed different strategies for diversifying key among them being acquisition of associates and subsidiaries as opposed to outright acquisitions, joint ventures and strategic partnerships, for example 49% stake in Irvine's Chicken by Innscor and 41.9% stake of listed Ariston holdings by Delta. These approaches ensure continuity of the existing businesses, previous owners continue to provide a wealth of experience and business knowledge. Thompson and Strickland (2006) favour the approaches for the same reasons.

5.3 Risks and Rewards Associated with Diversification

The study found out that diversification is risky especially where the conglomerate grows and controlling activities becomes difficult. The findings tend to concur with Markides and Williamson (2007)'s view that related diversifiers may fail to exploit relatedness whilst unrelated diversifiers may fail to reap benefits due to administrative costs, coordination costs, business risk and management problems associated with different line of businesses being brought together. The rewards in terms of profitability, earnings, dividends and market share price compensate for the risk taken as shown in the study as they improved with the adoption of diversification. This is in line with Gary (2005) who points out that diversification leads to stability of cash flows and improved

profitability.

5.4 Relationship between Diversification and Performance for the Conglomerates

For the conglomerates in the food and beverages sector in Zimbabwe, a positive linear relationship exists. The market power advantages, internal market efficiencies, shared resources advantages and financial advantages that diversified companies have over focused firm explain this relationship which was measured using turnover, profit and market measures in the study. The relationship depicts the Linear model (Miller, 2006).

5.5 Diversification and Shareholder Value

The study established that through diversification the conglomerates created value and justified their existence as they were able to build and leverage the unique resources to gain competitive advantage, increase profitability, market value of the companies ultimately improving shareholder value. Santalo and Beccera (2009) argued that value creation has been put at the top of the objectives which should guide firm strategy. Martin and Syrack (2003) found out that on average diversified firms increase shareholder value. They argued that on average diversification adds a premium to the value of the company thus improving shareholder value

The study concluded that the conglomerates had successfully used diversification as a long-term competitive strategy and had been able to establish a strong brand name and that it has used a combination of both related and unrelated diversification. Consistent with arguments by most researchers of the diversification-performance puzzle such as Daud et al. (2009), Syed and Rao (2004) and Thomas (2006), the research established that firm diversification was indeed related to accounting and market performance outcomes of a firm. The crux of the study centered on the answer of what is perhaps the most researched and yet unresolved question, how exactly does diversification affect firm performance?

After gathering empirical data, analyzing it and synthesizing models and theories from previous researchers, the research study indicated an important answer, which is diversification and performance were linearly and positively related. This confirms the linear model as explained by Palich et al. (2000) and Miller (2006). The benefits of diversification outweigh the costs hence performance increases or improves unconditionally contrary to Markides and Williamson (2007)'s view that as the firm increases diversification, it moves further away from its core business, and the benefits of diversification decline suggesting an intermediate model.

The conclusion also contradicts Hitt (2006) who argued that increased level of diversification increases performance up to a limit there after further diversification results in declining performance pointing to the inverted u shaped model. The study also echoes the belief of the executives who thought diversification enhances firm value because it contributes to the improvement of the firm's risk-return profile. This confirms the Capital asset Pricing Model and the Markowitz Portfolio theory that diversification helps in reducing risk.

The conglomerates persistently created shareholder value, beat the market index and had a lower market volatility moreover we found that the performance as measured in terms of turnover growth, net profit, ROS, ROE and ROA increased in line with increase in diversification from 2000 to 2004. This is in agreement with Kuppswang and Villalonga(2010) who have argued in support of diversification improving shareholder value and creating wealth and high returns for investors. The conclusion contradicts Campa and Kedia (2002) and Ozbas and Scharfstein (2010) who pointed to diversification having a value destruction effect. Diversification is a competitive strategy which can bring positive results to the company if well implemented and aligned to the firm's vision and overall strategy as demonstrated by the conglomerates.

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Are GCC Countries Converging or Diverging: Evidence from 1983–2011

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Abstract

In this paper we shed light on the six countries of the Gulf Cooperation Council (GCC) by empirically investigating the presence of convergence across these six countries, over a period (1983–2011). In this period there are significant events that affected these countries, including different episodes of expansions and recessions, fluctuations of oil prices, Gulf Wars (I, II, and III) and the 2008 financial crisis. In line with numerous studies on convergence, we use cross-state regressions to determine the existence or lack of convergence among the GCC countries. The empirical tests give some support to absolute and conditional β-convergence; however we don't find significant evidence of σ-convergence.

Keywords: growth, Beta convergence, Sigma convergence

1. Introduction

Since Solow's (1956) growth framework, differences in living standards and income throughout space and time have created a great debate in the literature. In the literature many attempts were done to measure the speed at which countries and regions move not only towards their own steady states but also towards income per capita of other countries and regions, which is defined as convergence. The literature has considerable research examination into the reasons and sort of differences in growth rates across regions and countries over time because of its considerable impact on peoples' standards of living, and because income disparities across-country and across-region are on the rise over time.

Convergence, which was initiated by Solow (1956) and verified by Baumol (1986), and Barro and Sala-i-Martin (1995), describes the process by which relatively poorer regions or countries grow faster than their rich counterparts. In the empirical research, convergence is generally divided into β-convergence, σ-convergence and club convergence. β-convergence exists when the partial association between income growth over time and its initial level is negative (Young et al., 2008). The β-convergence can be divided into absolute β-convergence (unconditional convergence) and conditional β-convergence. As for the σ-convergence, it means that the dispersion of real income across a group of economies falls over time, so the average GDP standard deviation of economic system possesses a descending trend.

The absolute β-convergence means that poor economic systems have quicker development speed than rich ones which implies that all countries or regions are converging to a common steady state level of income. As for the conditional β-convergence, which is the main argument of the "new theory" of endogenous growth, it implies that economies converge to a different steady-state point of growth since they have different structures (Barro & Sala-i-Martin, 1992). β-convergence remains a primary focus of growth empirics, perhaps because, intuitively, it seems to be necessary for σ-convergence (Young et al., 2008). The absolute and conditional convergence hypotheses have been examined by numerous academics using different practices, procedures and data sets and appear to be strongly accepted by some of the data sets and rejected by others. Club convergence defined as that incomes per capita of countries identical in structural characteristics (technologies, rates of population growth, preferences, government policies, etc.) converge to one another in the long run given that their initial conditions are similar as well (Galor, 1996).

The objective of this paper is to empirically investigate whether there is a tendency for convergence among the six members of the Gulf Cooperation Council (GCC) countries. The Gulf Cooperation Council (GCC) was

established in 1981, containing six countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the U.A.E with the objective of strengthening economic integration and coordinating monetary and financial policies towards achieving a monetary union between the members in the long-run. The six member countries have a lot in common in terms of social, historical, cultural, and religious standards. These factors along with geographic proximity facilitated interaction and created homogeneous characteristics. The paper sheds light on the income gap between these countries if it has narrowed or rather widened over the past 29 years (1983–2011). The paper contributes to the literature by being the first attempt (up to our knowledge) to examine convergence among the GCC members using a sample that contains significant and dramatic changes in the GCC economies. These effects include different episodes of expansions and recessions, fluctuations of oil prices, Gulf Wars (I, II, and III) and the 2008 financial crisis. These events may have impacted the countries differently. In line with numerous studies on convergence, we use cross-country regressions for determining the existence or lack of convergence among the six countries. The empirical tests give some support for absolute and conditional β-convergence; however we don't find significant evidence of σ-convergence.

The remainder of this paper is organized and structured as follows. Section 2 reviews the litrature. Section 3 discusses the conceptual and methodological estimation of convergence, besides describing the data set used. Section 4 summarizes our empirical findings and estimation results, whereas Section 5 concludes.

2. Litrature Review

In testing convergence hypothesis, most of the studies used cross-sectional data to investigate the correlation between initial per capita income and growth rates in cross-country and cross-regional studies. The evidence of convergence is documented by a negative association between income differences and initial income levels, as it indicates that the per capita income growth rate of the initially poorer economies is growing faster than those richer economies. This method provided evidence in favor of the convergence (Baumol, 1986; Barro, 1991; Barro & Sala-i-Martin, 1991, 1992; Mankiw et al., 1992; Engelbrecht & Kelsen, 1999; Zhang, 2003).

Using time series techniques to examine convergence hypothesis is another line in the literature. Under this technique, the empirical literature study output convergence using unit root and cointegration tests. Bernard and Durlauf (1996) highlighted that the cross-section perception of convergence is weaker than the time series perception. They showed that evidence of a negative association between income differences and initial income levels within the cross-sectional framework cannot be taken as indication of income convergence. Instead, it only suggests the idea of catching-up but not yet convergence. Bernard and Durlauf (1996) proposed two definitions of convergence, namely weak notion of catching-up and strong notion of long run convergence. Both definitions are testable within the time series framework. Utilizing time series techniques to investigate differences across countries in the long run behavior of per capita income was also utilized by Carlino and Mills (1993), Bernard and Durlauf (1995), Oxley and Greasley (1995), Evans and Karras (1996), Loewy and Papell (1996), Li and Papell (1999), St Aubyn (1999), Tsionas (2000) and Zhang et al. (2001) among others. However, time series evidence has not been entirely supportive of the convergence hypothesis (Gomez-Zaldivar & Ventosa-Santualaria, 2010).

Despite the extensive empirical work, the convergence debate continues entitled to the fact that the researchers are confronted with many statistical and conceptual drawbacks because of the measurement and assessment of convergence. In testing β-convergence, Barro and Sala-i-Martin (1992) examines the convergence of gross income for 92 countries and show that if the determinant factors of the steady-state income remain constant the convergence can be achieved. Mankiw et al. (1992) use a cross-section methodology for a sample of 98 countries and find evidence of conditional convergence when controlling for population growth and capital accumulation. Islam (1995) points out that conditional convergence occurs for real income per capita, using panel estimation techniques. Lee et al. (1997) develop four different techniques to test β-convergence with data from 102 countries. They find noteworthy differences for the steady-state growth rates across countries. Durlauf et al. (2005) point out that economies converge to their own different steady states implied by a negative coefficient (β) on initial income in a cross-section approach. Moreover, Pesaran (2007) contends that β-convergence indicates convergence within an economy.

For σ-convergence, many empirical studies use the variance of the logarithm of GDP per capita as a measure of inequality or dispersion. Dalgaard and Vastrup (2001) show, using GDP per worker data for 121 countries, that the coefficient of variation and the variance suggest different trends in inequality. Young et al. (2008) demonstrate, using U.S. county-level data containing over 3,000 cross-sectional observations, that σ-convergence cannot be detected during that time period or within the large majority of the individual U.S. states considered separately. Critics of σ-convergence argue that it provides a necessary, but not sufficient,

condition for observing reductions in real per capita income dispersion (Quah, 1993). The time series approach, in general, has rejected convergence. For example, Bernard and Durlauf (1995) find that time-series forecast convergence can be rejected across all OECD economies using Maddison (1982, 1989) time-series data. Similarly, Hobijn and Franses (2000), find little evidence of convergence across 112 countries for the period 1960–1989. Pesaran (2004) confirms the findings of little convergence for both Maddison and Penn World data sets. Evans and Karras (1996) use the cross-country variances of per capita real income for 15 countries, and indicate that income reverts to a common trend. However, the utilization of unit root tests and cointegration to test output convergence is subject to a number of severe drawbacks (Apergis et al., 2011).

3. Model and Data

Barro and Sala-i-Martin (1992) report two broad concepts of convergence; β-convergence and σ-convergence. The former refers to convergence of per capita income through the catch-up growth process, while the latter implies the convergence of cross-sectional dispersion of per capita income. As shown previously, testing convergence hypotheses was applied utilizing different methodologies. In line with Baumol (1986) and Baro and Sala-i-Martin (1992, 1995), the majority of the tests involved fitting cross-country regressions, where a negative correlation between growth rates and the initial per capita income implies absolute convergence.

Following Barro and Sala-i-Martin (1992), we specify the following regression equation to measure absolute β-convergence among the economies of the six GCC members:

$$(ln\, y_{i,T} - ln\, y_{i,0})/T = \alpha - \beta\, ln\, y_{i,0} + \varepsilon_i \tag{1}$$

where $ln\, y_{i,0}$ is per capita real GDP in year 0, $ln\, y_{i,T}$ is per capita real GDP in year T, T is number of years in observation period, α is a constant and ε_i is normally and independently distributed error term. From equation (1), a positive β indicates that the data exhibits absolute β-convergence.

On the other hand, conditional β-convergence implies that a country or a region is converging towards its own steady state. To test for conditional β-convergence, we extend equation (1) by using a set of variables (X_1, X_2) to control for country-specific effects that differ between individual countries and affect the change in the per capita growth rate. By accounting for these unobserved differences for all six countries, it can be determined whether or not country-specific effects influence the test of convergence. The following regression equation measures conditional β-convergence among the six countries:

$$(ln\, y_{i,T} - ln\, y_{i,0})/T = \alpha - \beta\, ln\, y_{i,0} + \lambda_i X_{i,t} + \varepsilon_i \tag{2}$$

where $X_{i,t}$ is a vector of explanatory variables (gross saving as percentage of GDP, and annual population growth). When the estimated coefficient β is positive, it indicates that the data exhibits conditional β-convergence.

The σ-convergence indicates that during the growth process the income levels of six countries will become more equal, and the variation between their per capita GDP levels will gradually decrease. The σ-convergence measures the dispersion of real income or product per capita among regions based on the standard deviation of the cross-section series. When the standard deviation decreases over time, it indicates that the differences of the income per capita between regions in absolute terms tend to decrease with the passage of time, which is a support of convergence. On the other hand, the increases in the standard deviation of the series in terms of the income per capita over time imply divergence. A mixed process of converge and divergence takes place when the standard deviation does not show any clear tendency, but instead, increases or decreases alternatively. Barro and Sala-i-Martin (1995) point out that the dispersion can be measured by calculating the standard deviation of the per-capita logarithm for each year. The following formula is used to estimate the standard deviation for each year:

$$\sigma_t = \sqrt{\frac{1}{n}\sum_{t=1}^{n}(ln\, x_{i,t} - ln\, \bar{x})^2} \tag{3}$$

where σ_t is the standard deviation at period t, $ln\, \bar{x}$ is the logarithm of the average per capita GDP of countries at period t, and $ln\, x_{i,t}$ is the logarithm of per capita GDP in country i at period t respectively; and n is the number of countries. σ-convergence exists if σ_t is less than σ_{t-1}, but if σ_t is more than σ_{t-1}, then σ-convergence does not exist.

The data used to test convergence among the six GCC countries are from the World Bank. The data are annual and cover the period 1983–2011. This time span covers periods of recession and growth. It also captures several shocks to the GCC economies, such as the three Gulf Wars (1980–1988, 1990–1991, 2003), and oil price fluctuations (Note 1). The data set includes per capita real GDP by country (constant 2005 U.S. dollars), gross saving as percentage of GDP, and population annual growth. Variables used here are proxies for the differences among the six countries, where the effect of the economic crises or shock was different among them. Regarding

"β" and "σ" convergence, a noteworthy question stands out is which of the two concepts is more desirable. Sala-i-Martin (1994) points out that both concepts are valuable, because they measure convergence or divergence in a different way and they present different information. However, "β" convergence is a more appealing concept since it looks at whether poor economies are anticipated to grow faster than rich ones, and how fast the convergence process is. He also underlines that these issues can be examined independently of whether the "σ" convergence predicts that the aggregate cross-sectional variance is decreasing or increasing over time.

4. Empirical Analysis

To investigate convergence among the GCC countries, we start with a visual inspection of the per capita real GDP where we plot the per capita real GDP for the GCC countries to check if the gap among the countries tends to fall over time. Figure 1 reports these plots.
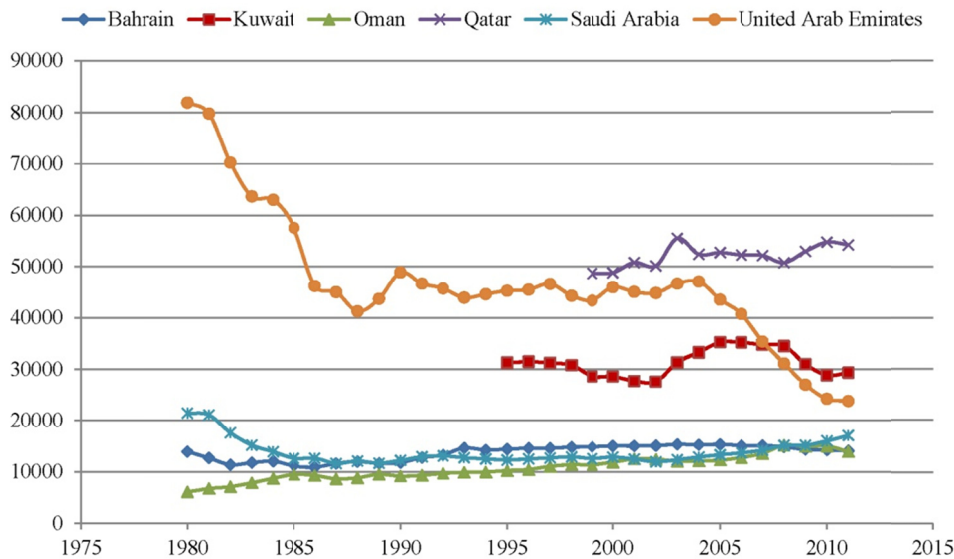
Figure 1. Per capita real GDP (1980–2011)

The plots show weak evidence that the countries are closing the gap and therefore, converging. For example, Qatar is diverging away from the rest of the countries. The UAE was slowing down, but the gap compared to Saudi Arabia, Bahrain and Oman is still not closing. Kuwait is showing divergence with respect to the rest. So figure 1 does not indicate encouraging results about states converging to the same steady state of growth, and therefore we proceed with our empirical examination by testing the three types of convergence.

Table 1. The regression of absolute convergence

Variable	Coefficient
β	0.0171*
	(0.0075)
constant	0.171*
	(0.0712)
convergence rate (Θ)	0.06%
R^2	0.263
number of observations	6

Note. The dependent variable is $(ln\, y_{i,T} - ln\, y_{i,0})/T$. Convergence rate (Θ) is calculated as $= -\ln(β + 1) / T$, where $T = 29$ (the number of years in the time period). Robust standard errors are reported in parenthesis.

* Significant at the 10% level.

In order to obtain a deeper understanding of the convergence process among the countries, we proceed with the empirical test. We start by estimating equation (1), which models absolute β-convergence (unconditional) among the six countries. The model was estimated using Ordinary Least Squares (OLS) technique. The estimation results are presented in Table 1.

The estimated β coefficient of the initial per capita income level is positive and significant, confirming the proposition of the absolute income convergence over the 29 years period as theorized by the neoclassical growth model. The estimation shows evidence that all six countries are converging to a common steady state during the period 1983–2011. Thus, there exists unconditional β-convergence across the GCC countries. This result coincides with Sala-i-Martin (1996) who presented evidence of absolute convergence for US states and regions. Following Lim (2003), we calculate the annual rate of income convergence over the 29 years period and find it to be 0.1% (The convergence rate is calculated as: $\theta = -\ln(\beta +1) / T$, where T is the number of years in the time period). The convergence rate measures how fast economies converge towards the steady state. Then 0.06% of the gap between the states vanishes in 1 year.

For further analysis, we test if the dramatic changes in the GCC economies such as rising oil prices, Gulf Wars (I, II, and III), and the world sub-prime mortgage crisis in 2008 may have impacted the six countries differently, and affected the convergence process or it did not where its effect was negligible. To do so, we estimate equation (2) that captures conditional β-convergence within the data set, using OLS. Table 2 reports the results. The regression results indicate that including the control variables (gross saving as percentage of GDP, and population annual growth) did not change the significance or the sign of the coefficient of the initial per capita income level; where β is still positive and significant, thus indicating conditional convergence. The estimation shows evidence that each country is converging toward its own steady state during the period 1983–2011. The annual rate of income convergence (convergence rate) over the 29 years period now is 0.04%. Then 0.04% of the gap between country's real GDP and its steady-state value vanishes in 1 year. Conditional convergence suggests that each country possesses its own steady-state per capita real GDP to which it is converging. The steady state in each country is conditioned on the state of its economy. However, in both models, absolute and conditional, our annual rate of convergence is less than 2% rate found by Baro and Sala-i-Martin (1992). This could be because our data set is shorter, and it could be capturing different economic events and crises.

Table 2. The regression of conditional convergence

Variable	Coefficient
β	0.0238***
	(0.0002)
gross saving as percentage of GDP	0.0008***
	(0.00004)
Annual population growth	0.0046***
	(0.00001)
constant	0.1821***
	(0.003)
convergence rate (Θ)	0.04%
R^2	0.331
number of observations	6

Note. The dependent variable is $(ln\, y_{i,T} - ln\, y_{i,0})/T$. Convergence rate (Θ) is calculated as $= -\ln(\beta +1) / T$, where $T = 29$ (the number of years in the time period). Robust standard errors are reported in parenthesis.

*** Significant at the 1% level.

Finally, we test sigma convergence by estimating equation (3) (Note 2). The calculation of the standard deviation of 1983 (initial year) and 2011 shows that σ-convergence does not exist, since σ_{2011} exceeds σ_{1983}. Sala-i-Martin (2000) shows that β-convergence is necessary but not sufficient condition for σ-convergence, where one could find β-convergence without finding σ-convergence. Sala-i-Martin, when using a sample of 110 countries over the period 1960–1990, does not observe the cross-country variance to decline, and therefore finds no evidence for σ-convergence.

5. Conclusion

The hypotheses of absolute and conditional convergence have been examined by numerous researchers through different approaches and data sets, and appear to be solidly discarded by some data sets and recognized by others. This paper is an attempt to comprehend and re-examine the convergence process (poorer countries catching-up with richer ones) among the six countries of the GCC from 1983 to 2011. The contribution of this paper is that it tests new data set that captures different economic shocks and crises, and it uses latest data available. The empirical tests give some support for absolute and conditional β-convergence; however we don't find significant evidence of σ-convergence.

Acknowledgements

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Notes

Note 1. By the end of 2001, oil prices started to steadily increase reaching $40–50 by the end of 2004. Then Crude oil prices surged to a record high above $60 in June 2005, over $77 in July 2006, above $90 in October 2007, and reaching a new record of all time of $147 in July 2008 (see Kisswani, 2011).

Note 2. Results can be submitted by authors upon request.

The Future of Islamic Banking in Sultanate of Oman

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Abstract

The study aims to identify the future of Islamic Banking in Sultanate of Oman. Islamic Banks adhere to the concepts of (Sharia'ah) Islamic law. The basic source of shariah principles are the Holy Quran which are followed by the consensus of the jurisits and interpreters of Islamic law. The shariah prohibits dealing with interest (Riba) in any shape or form which is the most essential feature of Islamic Banking. The study identified the phenomena related to future of Islamic Banking, Customer's attitudes of Islamic Banking and the effect of Islamic Banking on economy of Oman. Descriptive research design was adopted and proportionate stratified random sampling was chosen for study. The strata were mutually exclusive. Questionnaires on the future of Islamic Banking in sultanate of Oman were distributed among customers and economist in Muscat, Sultanate of Oman. Eighty questionnaires were received from the respondents (customers) and twenty four questionnaires were received from the Economist. Data were refined, tabulated and analyzed. Result indicated that the respondents showed a positive attitude towards dealing with Islamic banking and it supports the national economy.

Keywords: customers, descriptive statistics, economist, Islamic banking, Oman, Riba (interest), Shariah (Islamic law)

1. Introduction

Islamic Banking is banking based on Islamic law (Shariah). It follows the Islamic rules and practices primarily from the Holy Quran and secondarily from the opinions collectively agreed among shariah scholars. The shariah board is a key element of the structure of an Islamic financial institution, carrying the responsibility of ensuring that all products and services offered by that institutions are fully compliant with the principles of shariah law. Shariah law is derived from Quran and the sunna. The decision to license the provision of Islamic Banking services in Sultanate of Oman have been announced in 2011. The Islamic banking is expected to experience a rapid growth. The main objectives of this decision were to create a stable Islamic finance industry offering credible banking proposition that complies with international best practices, protects customers, and reflects Shari'ah. All listed Omani banks have announced their interest in setting up Islamic Windows. In addition to this, Islamic Banking licenses were granted to two new entities in Oman who aim to operate solely in the Islamic Banking space i.e., Bank Nizwa and Alizz Islamic Bank.

This study examines the future of Islamic banking in Oman and the customer's attitude towards these banks, as well as the value that these banks would add to the Omani economy.

2. Theoretical Concepts

Islamic Banking is a banking activity that is consistent with the principles of Sharia and its practical application through the development of Islamic economics. 'Islamic Banking is Sharia complaint finance'. Interest (Riba) is prohibited by Sharia Law under Islamic principles, regardless of whether it is being paid or received.

Oman Banking Sector: The Oman banking sector consists of Commercial banks, specialized banks, non bank finance and leasing companies and money exchange companies which operates under the licensing and regulation of the Central Bank of Oman. The commercial banks dominate the financial sector in Sultanate of Oman.

Islamic Banking in Oman: His Majesty Sultan Qaboos Bin Said has approved the establishment of Islamic Bank in the Sultanate of Oman. The Oman cabinet announced the decision to permit opening of an Islamic bank and

Islamic windows at local banks as allowed by his Majesty. Oman is the last and the sixth member of GCC to enter the Islamic Banking Business. The Central Bank of Oman has drafted a regulatory framework for Islamic Banking which brings clarity to financial institutions in the market.

Table 1. Islamic banks in Oman as at 30 March 2013

Number	Name of the bank	Types
1	Bank Nizwa	Islamic banks
2	Alizz Islamic Bank	Islamic banks
3	(Alhalal) Alahli bank	Islamic windows
4	(Muzn) Bank Dohfar	Islamic windows
5	(Meethaq) Bank Muscat	Islamic windows
6	(Misarah) National Bank of Oman	Islamic windows

Source: Central Bank of Oman–CBO Quarterly Statistical Bulletin–December 2012.

Table 2. Islamic banking product

Islamic banking product	Definition	The product in commercial bank
Mudaraba	Agreement between two parties where by one party (rab al maal) provides funds and the second party (mudarib) invests in a specific Shari'a compliant enterprise or activity for a share in the profits	Finance by way of trust
Murabaha	Agreement whereby a party (the bank) sells to the customer a commodity or asset which it has purchased based on a promise from the customer to buy the item on specific terms and conditions.	Cost-plus financing
Musharaka	Agreement between two (or more) parties to contribute to a particular investment enterprise, existing or new, or to the ownership of a property either permanently ('constant' musharaka) or under a diminishing arrangement resulting ultimately with the customer acquiring full ownership ('diminishing musharaka')	Partnership
Sukuk	Asset backed security where the ownership of tangible assets is divided into units of equal value and securities issued as per value	Participation securities
Salam	Contract is an agreement for advance payment in exchange for goods to be delivered at a future date.	Advance purchase
Istisna'a	Agreement between the bank and a customer whereby the bank sells to the customer a developed property according to agree upon specifications	Commissioned manufacture

Source: Bank Nizwa–Prospectus Report, 2012.

3. Literature Review

Review of literature was done to report the studies related to Islamic Banks. Following studies examined the underlying phenomena of Islamic Banking in various countries. Review provided a foundation to identify the research gap for the present study.

Rammal and Zurbrugg (2007) analyzed the awareness of profit-and-loss sharing financial instruments among 300 Australian Muslims to know the willingness of respondents to purchase profit-and-loss sharing Islamic banking products. The results indicate that the majority of the Australian Muslim population sample would be willing to purchase Islamic banking products, but are not properly informed about profit-and-loss sharing instruments. The results further hint towards a lack of understanding of the principles of Islamic finance. Ahmad (2008) investigated the opportunities and challenges of Islamic banking in United Kingdom with a nine in depth interviews with three different groups of people such as banking authorities, customers of Islamic banking and non customers of Islamic banking and the result revealed that Islamic banking is facing some challenges in UK because the financial system is more favorable to conventional banking and there is a greater opportunities in UK for the development and growth of Islamic financial system because Muslim community is eager to take financial products as they are willing to spend their lives according to their religion. Pawandeep (2008) made a study on future potential of Islamic Banking in India which is the third largest muslim populated country in the

world. The study identified the significant challenges to materialize the objective of expansion of Islamic banking in India. the product trends are positive in India. Soumik (2008) examined the reasons for working of Islamic financial institutions and start of Islamic banking in India and discussed the changes which is required in regulation and other obstacles of Islamic banking in India. Wilson (2009) evaluates the development of Islamic banking in the GCC. An examination is made to the extent of which government policy, through both legislation and regulation, has facilitated the development of Islamic finance. Shariah governance systems are appraised, in particular the working of the devolved form of self governance by Islamic financial institutions. The deposit facilities offered by Islamic banks in the GCC were discussed. The Issuance and trading of Islamic sukuk securities were also considered and the role of regions financial centers.

A similar study was conducted by Memon (2007) emphasized the role of Islamic banks as financial intermediaries and the importance of financial intermediation for society. Islamic banking an alternate to interest based banking employed the concept of participation in the enterprise, utilizing the funds at risk on a profit and loss sharing basis. The status of Entrepreneurs in Islamic banking is either of partner or investors who maintains ethical relationship with Islamic banks and are not involved in businesses that are prohibited by the Islamic Law. Khan and Bhatti (2008) highlighted the unprecedented growth of Islamic banking and finance in the contemporary finance world. It draws attention towards the growing number of products, systems, infrastructure and supporting institutions of Islamic banking. The current trends, strength and weakness of Islamic banking has been discussed. Ramzan et al. (2012) analyzed the strength and financial health of the Islamic banks of Pakistan by using AID model. The data of all Islamic banks in Pakistan were gathered and analyzed in order to prove quantitatively through AID model that Islamic banks have shown a remarkable growth as a milestone for future Islamic banking.

Mamun (2011) investigated the perceived prospects and growth potential of Islamic banks in Bangladesh. Findings of this research indicate that there is a demand for interest free banking services from the Sharia abiding users. The survey results illustrate that legal support, interbank money market and linkage with other institutions could improve the prospects for Islamic banks in Bangladesh. The study emphasizes the need to have more institutions providing information on operations and principals of Islamic banking. Ullah and Chowdhury (2013) studied the problems and opportunities of Islamic banks in Bangladesh. The study emphasized the development of an interbank Islamic money market, activation of Shariah supervisory board and enactment of Islamic Banking Act. Further it is stated that Islamic banks should introduce new shariah compliant financial products in line with the Islamic shariah and extension of investment in line with PLS framework especially by constituting consortium or syndication by the Islamic Banks.

Literature related to Future of Islamic Banking was primarily based on the study on Islamic Banking in different countries. Some of the study even focused on some specific financial intermediaries to examine the phenomena and dealing related to the working of Islamic Banks. This study made an attempt to study the Future of Islamic Banking in Sultanate of Oman.

4. Significance of the Study

The study focused on the future of Islamic Banking to analyze the results and its relationship in banking organization in Sultanate of Oman. Islamic Banking takes into consideration the needs and preferences of Muslim Clients, who forbid interest based transactions (Shariah–Islamic Law). Muslim clients are concerned about Riba (interest) and they donate their interest received. Islamic finance is growing rapidly due to the demand for shariah complaint products from many Muslim countries, thus representing the expansion of Islamic finance a global phenomenon. The activities which are interest free and do not entails pork, alcohol, firearms, gambling are permitted in Islamic finance. The study covers the customers of Islamic Banks and the economist in the Sultanate of Oman. This study may help the Islamic Banks to initiate some change in its working.

5. Objectives of the Study

a.   To study the future of Islamic Banking in Sultanate of Oman.

b.   To identify the effect of Islamic Banking on National Economy of Sultanate of Oman.

c.   To find out the customers attitude towards the Islamic Banking Services.

6. Hypotheses of the Study

Ho 1: There is no significant relationship between customers attitude towards Islamic banking.

Ho 2: There is no significant effect on the Oman economy with the opening of Islamic banks.

7. Scope of the Study

The study investigates the phenomena related to Future of Islamic Banking in Sultanate of Oman from an

academic point of view. It identifies the effect of Oman economy through Islamic Banking, the future of Islamic Banking and customer's attitude towards the Islamic Banking in Sultanate of Oman. The study provided a foundation in exploring the future of Islamic Banking which will further help the Banking Sector to create best ideas and draw suitable plans.

8. Research Methodology

8.1 Research Design

Descriptive Research design was used for this research based on adoption of survey method.

8.2 Sampling Design

Proportionate Stratified Random sampling method was adopted for this study. 100 questionnaires were distributed among customers of Islamic Banks and 30 questionnaires were distributed among Economist of Oman.

8.3 Sample Size

The Total Sample Size in the present study was 104 which constitute 80 customers of Islamic Banks and 24 Economist of Sultanate of Oman.

8.4 Sample Unit

Sample unit consist of Customers of Islamic Banks in Oman and the Economists in the Sultanate of Oman government entities and Islamic banks employees.

8.5 Data Collection Method(s)

Both primary and secondary data were used.

Primary data: The data was collected through two self administered Questionnaires for the customers of Islamic Banks and the Economist of Oman.

Secondary data: The data were collected through the following sources:

i. Internal sources.

ii. Journal research articles

iii. Internet.

9. Data Analysis Method

The data collected from the sample was analyzed by using descriptive statistics and t-test. For analysis of the data SPSS 19.0 Version is used.

10. Results and Discussion

Table 3. Reliability test of questionnaire

Questionnaire	Cronbach's Alpha	No. Of items
Customers Questionnaire	.731	16
Economist Questionnaire	.714	18

Cronbach Alpha coefficient has been used to test the reliability. Cronbach alpha coefficient is an indicator of internal consistency of the scale. Robinson and Shaver 1973, suggested that if Alpha is greater than 0.7 it means high reliability and if Alpha is smaller than 0.3 it means low reliability. From table 3 it is revealed that the reliability test of Questionnaire is highly reliable as the Alpha value is greater than 0.7.

Demographic Characteristics of the sample of the respondents are presented in order to get clear information of the sample.

Table 4. Demographic profile of respondents

Table 4.1. Gender of the respondents

Gender	Customers of Islamic Bank		Economist of Oman	
	No.Of Respondents	% of Respondents	No.Of Respondents	% of Respondents
Male	48	60	17	71
Female	32	40	7	29
Total	80	100	24	100

Table 4.1 shows the gender of the respondents 60% of the customers are male and 40% are female among the customers of Islamic Bank and 71% of respondents are male and 29% are female among the economist of Oman.

Table 4.2. Age of the respondents

AGE	Customers of Islamic Bank		Economist of Oman	
	No. Of Respondents	% of Respondents	No. Of Respondents	% of Respondents
20 -30	33	41.3	4	16.7
31-40	38	47.5	11	45.8
41-50	9	11.3	8	33.3
51 & above	0	0	1	4.2
TOTAL	80	100	24	100

Table 4.2 revealed the age group of the respondents which shows that majority of the respondents among customers 47.5% and economist 45.8% are in the age group of 31–40 years of age.

Table 4.3. Qualification of respondents

Qualification	Customers of Islamic Bank		Economist of Oman	
	No. Of Respondents	% of Respondents	No. Of Respondents	% of Respondents
Diploma	22	27.5	2	8.3
Bachelors Degree	33	41.25	11	45.8
Post Graduate Degree	25	31.25	11	45.8
TOTAL	80	100	24	100

Table 4.3 showed that majority of the customers of Islamic Bank holds Bachelor's degree 41.25% and majority of the economist hold Bachelors and Post Graduate degree 45.8%.

Table 5. Hypothesis testing

Ho1: There is no significant relationship between customers attitude towards Islamic banking.

Table 5.1. Result of t-test regarding customers attitude towards Islamic banking

	t-value	Df	Sig(2-tailed)	Result	95% confidence interval of the difference	
					Lower	Upper
Attitude	-21.461	79	.000	*S	-1.1759	-.9763

*S = Significant at 5% level of significance.

Table 5.1 shows the result of t-test which reveals that the customer's attitude towards Islamic banks are significant which means that the customers showed a positive attitude towards Islamic Banking in Oman.

Ho 2: There is no significant effect on the Oman economy with the opening of Islamic banks.

Table 5.2. Result of t-test regarding Oman economy towards Islamic Banking

	t-value	Df	Sig(2-tailed)	Result	95% confidence interval of the difference	
					Lower	Upper
Attitude	-10.860	23	.000	*S	-1.4385	-.9782

*S = Significant at 5% level of significance.

Table 5.2 shows the result of t-test is significant which implies that the economist believe that opening of Islamic Banks will have a positive impact on Oman economy as a whole. It is concluded that economist showed an affirmative approach towards opening of Islamic Banks in Oman.

Table 6. Response of economist regarding effect of Islamic bank in Oman economy

Sl.No.	Factors	Percentage of Responses					Total
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
1	Islamic banks will contribute to increase the national income	45.8%	50.0%	0	4.2%	0	100
2	Islamic banks will encourage investment in Oman	25.0%	70.8%	4.2%	0	0	100
3	Islamic banks will contribute to the stability of the financial and monetary system	41.7%	58.3%	0	0	0	100
4	Islamic banks will encourage citizens to savings	25.0%	50.0%	16.7%	0	8.3%	100

Table 6 depicts that majority of the respondents agreed that Islamic Banks in Oman supports the national economy. 95.8% of the economist agreed that Islamic Banks will contribute to increase the national income and encourage investment in Oman. 100% of the economist agreed that Islamic banks will contribute to the stability of the financial and monetary system. 75% of the economist agreed that Islamic banks will encourage savings among the citizens.

11. Conclusions

The study focused on the Future of Islamic Bank in Sultanate of Oman. Study was extended to report the effect of following demographic factors such as gender, age, and qualification of the respondents. The profile of the respondents shows that 48% are male and 32% are female among customers of Islamic Banks and 71% are male and 29% are female among Economist. It is also found that 47.5% of customers and 45.8% of economists are between the age group of 31–40 years. Majority of the respondents among customers 41.25% are holding bachelors degree and 45.8% of the economist are bachelors and post graduates.

t-test has been done to know the attitude of customers towards Islamic bank in Oman and the effect on Oman economy with the opening of Islamic Bank and it is stated that there is a significant difference among the customers attitude of Islamic bank and Oman economy in the Sultanate of Oman.

Study concluded that the future of Islamic bank in Oman will achieve great success as the customers have a positive attitude towards the dealings with Islamic bank. It is also revealed from the study that Islamic bank will contribute to the prosperity of the national economy and will contribute to the stability of the financial and monetary system in Sultanate of Oman.

12. Directions for Future Study

I. Further study can be done on a large sample size.

II. Comparative study can be done for Commercial banks and Islamic Banks in Sultanate of Oman.

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Abbreviations

UK = United Kingdom;

AID = Assets, Investments and Deposits;

PLS = Profit and Loss sharing;

SPSS = Statistical Package for Social Sciences.

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Shariah Audit Certification Contents: Views of Regulators, Shariah Committee, Shariah Reviewers and Undergraduate Students

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Abstract

Shariah Audit certification will show the stakeholders that Shariah auditors are skillful and competent in their field. Shariah audit practices should be identified at the professional and certified level. There should be a 'Certified Shariah Auditor' to ensure that the Shariah auditor is proficient to perform the task. This issue can be resolved through the certification program. Shariah audit is considered a new area in Islamic finance. It assures that institutions embracing Islamic finance are true to the Shariah principles by them having to undergo periodical audit on Shariah matters. There is a gap in the industry to the certification of Shariah audit as currently no certification is required for Shariah auditors, and there is no professional body offering Shariah audit certification. This research aims to identify the content/scope/ of Shariah audit certification. Data were collected through questionnaire survey method. The subjects for questionnaire distribution are the regulators, Shariah Committee members, Shariah Reviewers in the Islamic banks and undergraduate students. This study contributes on the contents for Shariah audit certification program. The results reveal that Shariah audit certification should at least cover the scope of Shariah audit outlined by Bank Negara Malaysia (BNM), financial statements and internal control systems of an Islamic bank. The contents of certification may also include the area of business policies, process and procedures, zakat calculation and payment, contracts and agreements, and assessment of financial resources. This study implicates that certification in this area will promote professionalism and improve the conduct of Shariah audit in the industry.

Keywords: shariah audit scopes, shariah professional body, shariah audit certification

1. Introduction

The total assets of Islamic financial industry have been growing fast for the past decades. The assets reached USD 1.6 trillion at the end of 2012 which increased to 20.4% as compared to the previous year (IFSB, 2013), and it is expected to reach USD 1.9 trillion (KFH, 2013). Considering the rapid growth, it is crucial that the Islamic financial industry should have a proper 'check and balance' mechanism in the form of auditing which suits the objectives and missions of its formation, the '*maqasid al-shari'ah*' (Yaacob & Donglah, 2012). Shariah audit is deemed important to fulfil the mechanism. According to Shariah Governance Framework of BNM, the Shariah audit function refers to regular assessment on Shariah compliance in the activities and operations of the IFI by qualified Shariah officer(s), with the objective of ensuring that the activities and operations carried out by the IFI do not contravene with the Shariah. It is argued that Shariah audit must be done by qualified and competent officers.

Certification can be a means to demonstrate the ability and qualifications. The primary aim of a certification audit is to examine whether existing quality, processes and activities comply with the standard requirements (Poksinska et al., 2006). Therefore, Shariah audit certification should be implemented in the Islamic financial industry since it enhances the auditors to demonstrate their competency and proficiency in the Shariah auditing field. Shariah audit certification is more than just proof of their knowledge and achievements. It is also an assurance to the stakeholders that the Shariah auditors are professionals and prepared to meet today's challenges.

Shariah audit certification will enrich the candidates with educational experience, Shariah and auditing skills, information, and business tools that can be applied immediately in any organization or business environment.

The current practice shows that each IFI conducts its own Shariah audit trainings (Shafii et al., 2013). However, there is an issue that highlights on the eligibility of the knowldege and skills of the trainers that conduct trainings in Shariah audit. Shariah auditors can ensure compliance with Shariah if they are aware of Shariah issues and Shariah rulings. Kasim (2012) states that in modern business environment, the challenge for Islamic scholars is to interpret Islamic principles in a manner that meets the modern day requirements but at the same time does not jeopardise the protection and promotion of the Islamic identity. Therefore, Shariah auditors' performance would be questionable if they do not understand the essence of fatwa and Shariah rulings. For certain professions, certification is required to ensure the competence and expertise in particular fields. For instance, accountants and auditors are required by law to be certified as 'Certified Public Accountant' or 'Certified Internal Auditor'. Since Shariah audit demands specific skills and proficiency, it should also aim to be recognized at the professional level. There should be a 'Certified Shariah Auditor' to ensure that the Shariah auditor is capable of performing audit as well as ensuring Shariah compliance. The issue can be resolved through the certification program in Shariah audit.

Another problem Shariah audit is considered new in auditing practices. Audit scope is to give an assurance that the practices are in line with certain standards. The current standards which are based on conventional framework seem insufficient to guide the Islamic Financial Institutions (IFIs) (Sarea & Hanefah, 2013). Shariah should depicts the Islamic judgments and rulings. Hence, Shariah audit must be performed by a qualified auditor who should be knowledgeable in Syariah (Kasim, 2009). Shariah audit certification should accommodate audit competence and Shariah understandings. Accordingly, the objective of this research is to identify the content/scope/area of Shariah audit certification.

2. Literature Review

2.1 Regulatory Requirement for Shariah Audit

Islamic financial institutions in Malaysia are governed by the Islamic Banking Act, **Bank Negara** Malaysia's Shariah Advisory Council and **IFSB** standards. Every IFI has its own Shariah audit framework. Shariah audit is currently been performed by the IFIs in Malaysia in order to ensure that the activities and operations of an IFI are adherence to Shariah. This is in line with the Shariah Governance Framework (BNM, 2010) requirements on the implementation of Shariah audit in the IFIs. According to Shariah Governance Framework issued by Bank Negara Malaysia (2010) paragraph 7.7, *"Shariah Audit refers to the periodical assessment conducted from time to time, to provide an independent assessment and objective assurance designed to add value and improve the degree of compliance in relation to the IFI's business operations, with the main objective of ensuring a sound and effective internal control system for Shariah compliance."*

The Shariah Governance Framework (Bank Negara Malaysia (BNM), 2010) defines the responsibility of conducting Shariah audit lies in the hands of the internal audit unit. This signals that the responsibility of internal auditor has been expanded. The internal auditor not only act as the key of corporate governance as well as internal consultancy (Stewart & Subramaniam, 2009), but the role has been expanded to perform Shariah audit in ensuring that the operations of the IFI are Shariah compliant. This leads to the issue of competency of the auditor and auditor's performance in performing new task which has been outlined in the Shariah Governance Framework (Bank Negara Malaysia (BNM), 2010).

Islamic Financial Services Board (IFSB) through its Shariah Governance Standard (2009) strongly recommends Islamic financial industry to develop an internal Shariah audit by having Shariah officers with appropriate qualifications and experience. Specific criteria of Shariah audit officers are mentioned in the Standard. They must be competent and have good character comprising honesty, integrity, fairness and reputation. The IFIs should ensure that they should at least possess the appropriate knowledge and skills in order for them to adequately execute their duties and responsibilities. It is also emphasized in Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) that the Shariah auditor shall be knowledgeable about Shariah rules and principles, but would not possess the same level of knowledge as that of SSB members, and thus the auditor shall not be expected to provide interpretation of these rules and principles. The fatwas, rulings and guidance issued by the Shariah Supervisory Board (SSB) form the basis on which the auditor considers whether the IFI has complied with Shariah rules and principles.

2.2 Competency of Shariah Auditor

Flint (1988) stated that audit competence requires both knowledge and skill, which is the product of education,

training and experiences. In a standard issued by International Federation of Accountants (IFAC) on International Education Standard (IES) 8 Competence Requirements for Audit Professional, outlines that auditors must have the formal education (knowledge) relevant to audit (IES 2), professional skills (IES 3) and be able to apply the professional values, ethics and attitudes (IES 4) to different contexts and organizations. Based on these definitions, it is clear that auditors' competence is determined by considering a set of relevant attributes such as knowledge, skill and attitudes. Thus, the internal auditors who are attached to the IFI must not only have the auditing skills but also need to have an additional qualification which is Shariah knowledge specifically in Fiqh Muamalat. This is to ensure proper Shariah audit has been conducted and that the overall operations of IFIs are Shariah compliant.

According to Institute of Internal Auditors Malaysia (IIAM) 2010, the internal audit unit should be appropriately staffed in terms of numbers, grades, qualifications and experience, having regard to its responsibilities and objectives. The internal auditor should be properly trained to fulfil all his responsibilities (paragraphs 15 to 26). The effectiveness of internal audit depends substantially on the quality, training and experience of its staff. The aim should be to appoint staff with the appropriate accounting and Shariah background, personal qualities and potential. Thereafter, steps should be taken to provide the necessary experience, training and continuing professional education. It is argued that accountants and auditors lack qualifications, knowledge and experience on Shariah especially among Shariah personnel, and lack of accountability of Shariah auditors (Karim, 1990; Yaacob, 2012; Yahya & Mahzan, 2012). Abdul Rahman (2008) argues that one of the challenges in implementing Shariah audit would be to produce competent and independent Shariah auditors. He also suggested that the education and training program on Shariah audit should equip the Shariah auditor with two basic knowledge i.e. specialised Shariah knowledge as applied in Islamic banking and finance, and accounting and auditing knowledge and skills. In order to fulfil the current needs on the competency and qualification level of a Shariah auditor, there is a need for a certification program on Shariah audit. Certification program on Shariah audit will satisfy the industry demand on Shariah and finance knowledge, competency and qualification level as a Shariah auditor. For Shariah audit to be implemented correctly there is a need for certification.

In the most recent study, Shafii et al. (2013) found that competency of Shariah auditor shall be determined by each of the Islamic Banks, well equipped with both accounting and Shariah knowledge. From the focused group interview, the study found that the internal auditors may invite the Shariah team to be involved in performing Shariah audit and if the bank has an experienced staff without qualification in accounting and Shariah, it should send the staff for Shariah trainings.

2.3 Shariah Audit Certification

Auditing and certification practices play a key role in most accountability processes which permeate modern society, being viewed by many as an obligatory point of passage in producing legitimacy in the eyes of a large array of stakeholders (Boiral & Gendron, 2011). Currently, there is no professional body or institution that offers Shariah audit certification. However, there are few institutions that provide trainings in Shariah audit such as CERT, Redmoney and AsiaBIS. These trainings are conducted based on the demand that the Shariah auditor must be well equipped with necessary skills and knowledge to conduct Shariah audit. The Shariah auditor in the IFIs should continuously upgrade their technical knowledge with the current issues in Shariah audit. Due to that, with the current practice that was already in place, the industry should move into the next stage which is to propose a Shariah audit certification on Shariah auditor. This is to complement the existing practise held in the industry on Shariah audit to a wider dimension.

In the Middle East, Accounting, Auditing of Islamic Financial Institutions (AAOIFI) has initiated a certification on Shariah advisor and auditor. The certification issued by AAOIFI is also known as 'Certified Shari'a Adviser and Auditor' (CSAA). CSAA program is designed to equip candidates with the requisite technical understanding and professional skills on Shariah compliance and review processes for the international Islamic banking and finance industry. CSAA program covers technical subjects that are essential to Shariah compliance and review processes and procedures such as AAOIFI's Shariah standards on Islamic finance products and practices, AAOIFI's governance standards on Shari'a compliance and review processes, Islamic banking and finance supervision, and also the application of Shariah and Fiqh (Islamic jurisprudence) to Islamic banking and finance practices.

Through the CSAA program, the respected candidates will gain advanced knowledge on the roles and functions of various Shariah compliance and review processes in financial institutions. They will able to correlate between a financial institution's Shariah Supervisory Board (SSB) and its internal Shariah compliance and technical review of banking and financial operations processes. The program also provides the candidates with mechanism

to ensure Shariah compliance is in accordance to resolutions and fatwas (Scholars' rulings) issued by SSB.

In addition to that, in practicing Shariah audit in the IFIs, there are still lacking in terms of satisfying the general public and the clients of the IFI (Mufti Aziz Ur Rehman, 2012). He added that it is insufficient to say 'our Shariah Board approved' but it is the responsibility of the Shariah auditor to convince the client and prove the superiority of Islamic financial products in contrast to the conventional. This is because the level of public awareness on the Islamic financial products is poor. Thus, due to that, he recommended that the practice of Shariah audit shall be improved and strengthened in terms of formal official Shariah audit training and the establishment of some prequalification to be accepted on an AAOIFI CSAA study course to enhance the value and standing of the certificate. Standardization of Shariah audit procedures and more detailed standards for Shariah audit and governance are needed. Other than that, he strongly point out the needs to have a proper formal official Shariah trainnings or Shariah audit certification.

3. Research Methodology

This research collects data through questionnaire survey method. The instruments used in this research are a mail survey questionnaire and a direct questionnaire. The target respondents read the questions themselves and mark answers on a questionnaire. The subjects for questionnaire distribution are the regulators, the Shariah Committee, the Shariah Reviewer in the Islamic banks and the undergraduate students.

The questionnaires are divided into two types; those distributed to Shariah Committee, Shariah reviewers, regulators and those distributed to students. The questionnaires were distributed to undergraduate students to gain the general opinion on Shariah audit certification. The questionnaire is designed to obtain the information on the undergraduate final year students' perspective, awareness and understanding on the term and concept of Shariah audit in Malaysia. The respondents are students of the two selected Malaysian public universities. First group consists of final year students who have been taught Shariah auditing as part of their course syllabus. These students are selected because they have to learn Al-Tadqiq Al-Shari'e course (Arabic word for Shariah audit) as part of their course syllabus requirement. In the previous semester, they were also taught Fiqh Muamalat as part of their course requirement. The second group is final year students who learnt only conventional auditing course offered by a local university specifically Bachelor of Accountancy. A number of questionnaires were distributed to 380 students consisting of 200 students of the first group and 180 students of the second group.

The first section of the questionnaire purported to obtain the demographic information of the respondents. The next sections consists of questions posed on the level of awareness and knowledge of Shariah audit of the respondents and also questions on perception regarding Shariah audit practice in Malaysia in the form of Likert scales of five; ranging from (1) strongly disagree and (5) strongly agree. However, ranging from (1) to (5) with indication of strongly disagree and strongly agree. A total of 180 and 200 questionnaires were hand administered to the respondents but only 351are considered valid.

The other set of questionnaires were distributed to the individuals that directly related to the operations and Shariah compliance in 22 IFIs having their operations in Malaysia. The lists of IFIs were gathered through the BNM website. The target population in this study is defined as all individuals in Islamic banks who are aware of Shariah audit practices. They consist of Shariah Committee; Shariah reviewers and regulators. The regulators are representatives from Jabatan Perbankan, Insurans dan Takaful (JPIT) department and other related departments of BNM are included in the population due to their responsibilities to oversee the overall operations of Islamic banks. Descriptive statistics was used to analyze the questionnaires.

Table 1. Distribution of the survey questionnaires

Subjects	Population	Sample distribution	Sample representative	Received
Shariah Committee	113	65	39%	12
Shariah Reviewer	110	64	39%	13
Regulators (BNM)	60	36	22%	28
TOTAL	283	165	100%	53

From the above table, the respond rate of the study is 32%, which is considered adequate. Previous study conducted by Kasim (2009) on Shariah audit, the sample used for the study is approximately 155 respondents using similar target group. The study managed to receive 53 responses from the total sample. Shariah committee members, Shariah reviewer and regulators (BMN) were identified as primary parties involved in Shariah audit

practices.

4. Analysis and Discussion

All data are based on a 5 point-Likert-based scale, which is considered as ordinal data. The scale ranges from (1) strongly disagree to (5) strongly agree. The study utilized a non-parametric test in all the analyses performed. The reliability analysis was performed to test the reliability coefficient of the data using the Cronbach alpha. The Cronbach alpha coefficient for the first set of questionnaire (undergraduate students) is 0.71, which is slightly lower than the pilot study score but is acceptable for the further analysis. Nunally as cited in (Pallant, 2011) recommended a minimum of 0.7 Cronbach alpha value to be fulfilled before the data can be used for further analysis. For the second set of questionnaire (Shariah Committee, Shariah reviewers and regulators) the alpha value is at 0.72 which is considered to have internal consistency and hence reliable.

4.1 Undergraduate Students

Table 2. Distribution of respondents by gender (n=351)

Gender	Frequency	Percentage
Male	86	24.5
Female	265	75.5

The questionnaires were distributed to 380 undergraduate students and 351 questionnaires were considered valid. Table 2 indicates that out of 351 respondents, 265 are females representing a 75.5% of the samples and 86 males representing 24.5%.

Table 3. Awareness of Shariah audit (n=351)

Answer	Frequency	Percentage
Aware	271	77.2
Not aware	80	22.8

The Table 3 above shows that majority of the respondents, 77.2% are aware of the term Shariah audit. This indicates that Shariah audit is familiar to undergraduate students.

Table 4. Perception on general Shariah audit (mean score)

No	Statements	Mean
1	It is important to develop Shariah framework	4.62
2	Shariah audit framework is similar to conventional audit	2.09
3	Shariah audit framework should differ from conventional audit	4.30
4	Broader scope of Shariah auditing	3.53
5	Shariah auditing should confine to financial statements audit only	2.22

Table 5. It is important to develop the Shariah audit framework (n=351)

Strongly Disagree (1) to Strongly Agree (5)	Frequency	Percentage
1	3	0.9
2	1	0.3
3	17	4.8
4	84	23.9
5	246	70.1

On the development of Shariah audit framework, 70.1% strongly agree that it is important to develop the Shariah audit framework. Other than that, 23.9% agree. The mean score 4.62 shows that the respondents' opinions tend to strongly agree.

Table 6. Shariah audit framework is similar to conventional audit (n=351)

Strongly Disagree (1) to Strongly Agree (5)	Frequency	Percentage
1	134	38.2
2	103	29.3
3	74	21.1
4	27	7.7
5	13	3.7

The table shows that 38.2% respondents strongly disagree that Shariah audit is similar with conventional framework, and 29.3% of the respondents disagree with the similarity. It indicates that more than a half of the respondents (67.5%) disagree that Shariah audit framework is alike conventional audit. Only 3.7% strongly agree that the framework is the same. The mean score is 2.09 which can be concluded that the respondents disagree that Shariah audit and conventional audit are similar.

Table 7. Shariah audit framework should differ from conventional audit (n=351)

Strongly Disagree (1) to Strongly Agree (5)	Frequency	Percentage
1	12	3.4
2	7	2.0
3	36	10.3
4	103	29.3
5	193	55

From Table 4, the mean score (3.53) indicates that the responses are more toward agree that Shariah audit framework should distinct from conventional audit. Total of 79.3% of the respondents strongly agree and just agree that the theoretical framework should differ and only 3.4% disagree that the theoretical framework should differ. The result is consistent with the previous question asking the similarity of Shariah audit framework with the conventional framework.

Table 8. Broader scope of Shariah auditing (n=351)

Strongly Disagree (1) to Strongly Agree (5)	Frequency	Percentage
1	46	13.1
2	42	12
3	52	14.8
4	101	28.8
5	110	31.3

The mean score of broader scope of Shariah auditing is 3.53. Table 8 shows that 31.3% and 28.8% strongly agreed and agreed respectively that it should be broader than conventional auditing. 14.8% of the respondents were neutral with 12% disagreeing and 13.1% strongly disagreeing.

Table 9. Shariah auditing should confine to financial statements audit only (n=351)

Strongly Disagree (1) to Strongly Agree (5)	Frequency	Percentage
1	109	31.1
2	119	33.9
3	74	21.1
4	35	10
5	14	4

Only 14% of the respondents agree and strongly agree that Shariah audit should be limited to financial statement audit while 65% disagree. It means that Shariah Audit is expected to have broader scope of audit. The mean (2.22) also shows that the response rate is more towards neutral.

The results indicate that majority of the undergraduate students are aware of the term Shariah audit even though they have not been taught that subject. The respondents feel that it is important to develop Shariah audit framework because it is not similar with conventional framework. Therefore, the scope of Shariah audit should be broader than conventional audit. These results provide primary indication that can help the discussion on the contents of Shariah audit certification that it should be more than just financial statement audit.

4.2 Regulators and Shariah Committee

The survey instrument comprised a set of questions designed to elicit opinions on the framework, scope, competency, role and nature of Shariah auditing, regulations, reporting and also a set of questions to identify the elements associated with the Shariah auditors' performance. From the questions, the study can highlight the contents that should be included in Shariah audit certification. Therefore, the findings will only highlight the scope of Shariah audit for the purpose of certification content in order to meet the objective of the paper.

Table 10. Perception on general content of Shariah audit certification (mean score)

	Shariah Committee (n=12)	Shariah Reviewer (n=13)	Regulators (BNM) (n=28)	Mean value
The current scope of Shariah audit outlined by BNM in SGF are not sufficient	3.000	3.33	2.53	2.83
The internal auditors should attest the financial statements of the Islamic banks for Shariah compliance	4.25	4.11	3.35	3.67
Shariah audit should cover the Internal control system of an Islamic bank.	4.50	4.33	4.21	4.32
The scope on compliance covers organizational, structure, people, and process and information technology only.	3.83	3.22	3.21	3.43

Table 11. The current scope of Shariah audit outlined by BNM in SGF is not sufficient (n=53)

Responses	Frequency	Percent
Strongly Disagree	2	3.8
Disagree	19	35.8
Somewhat agree	20	37.7
Strongly agree	2	3.8

In general, the current scope of Shariah audit outlined by BNM in SGF is sufficient. This is supported by the mean value of respondents: 2.83. It reflects that most of the respondents disagree with the statement that the current scope of Shariah audit is not sufficient. Based on Table 10 above 35.8% and 37.7% 'disagree' and 'somewhat agree' with the scope of Shariah audit as per BNM's SGF. This study also investigated the perception of respondents on the general scope of Shariah audit. The table shows that it is slightly different between those who agree and disagree.

Table 12. The internal auditors should attest the financial statements of the Islamic banks for Shariah compliance (n=53)

Responses	Frequency	Percent
Strongly Disagree	4	7.5
Disagree	4	7.5
Somewhat agree	7	13.2
Strongly agree	28	52.8

Table 11 clearly shows that 52.8% of the respondents 'strongly agree' that the internal auditors who act as the Shariah auditors should attest the financial statements of the Islamic banks for Shariah compliance. Respondents from Shariah committee and Shariah Reviewer agree on the statement since the mean score for each group is

4.25 and 4.11 respectively. However, the regulators view differently as the mean score is only 3.35. The current auditing practice in the Islamic banks is done by the external auditors during the statutory audit. Thus, the internal auditors of the Islamic banks that perform Shariah audit will not repeat the job done by the external auditors. However, based on the survey, it is necessary for the internal auditors to attest the financial statement of the Islamic banks especially on the Shariah issues in the financial statements.

Table 13. Shariah audit should cover the internal control system of an Islamic bank (n=53)

Responses	Frequency	Percent
Strongly Disagree	1	1.9
Disagree	1	1.9
Somewhat agree	31	58.5
Strongly agree	20	37.7

Table 12 shows that 96.2% agree that Shariah audit should cover the internal control system of an Islamic bank. The mean value shows an average of 4.32 responses. According to an Internal Control for Shariah compliance should be designed and operated to provide reasonable assurance that an IFI's objectives are achieved in the following categories: effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws, regulations, accounting and auditing standards. It can be emphasized that the certification should also include the skill and knowledge on internal control system.

Table 14. The scope on compliance covers organization, structure, people, process and information technology only (n=53)

Responses	Frequency	Percent
Disagree	14	26.4
Somewhat Disagree	13	24.5
Agree	15	28.3
Strongly agree	11	20.8
TOTAL	53	100

Based on SGF (BNM, 2010) the scope on compliance covers organizational structure, people, and process and information technology. About 26.4% disagree on it. 28.3% agree that Shariah compliance should cover the areas in SGF (BNM, 2010) only. However, based on Table 9, the mean value for this statement is 3.43 which shows that the respondents are 'somewhat agree' with the statement. Thus, it can be concluded that, additional respondents are needed to gather more evidence on the extended scope of Shariah compliance since most of the respondents are neutral with the statement.

4.3 Contents of Shariah Audit Certification

Table 15. Perception on extended contents in Shariah audit certifications (mean score)

Content	Shariah Committee	Shariah Reviewer	Regulators (BNM)	Mean Value	Frequency	%
Business policies	4.41	4.51	4.28	4.24	31	58.5
Process and procedures	4.50	4.33	4.53	4.47	26	49.1
Zakat calculation and payment	4.50	4.33	4.46	4.43	26	49.1
Contracts and agreements	4.58	4.33	4.57	4.52	28	52.8
Assessment of financial resource management	4.41	3.55	4.28	4.20	26	49.1

The results of this study indicate that majority of the undergraduate students think that the scope of Shariah audit should be broader than conventional audit. Therefore, Shariah audit certification should at least cover the scope of Shariah audit outlined by BNM. The undergraduate students' opinion is in line with the responses of Shariah Committee, Shariah Reviewer and regulators. From their responses, it can be concluded that Shariah auditors

must be familiar with Shariah audit outlined by BNM since it is considered sufficient for Shariah audit. Shariah auditors should also be familiar with financial statements and internal control systems of an Islamic bank. From the results, it is proposed that the contents of Shariah audit certification should include the areas that Shariah auditors must be well equipped.

Regarding perception on extended contents in Shariah Audit Certification, table 14 shows that the responses Shariah Committee, Shariah Reviewers, and Regulators have mean values above 4. It means the respondents also agreed that the extended contents in Shariah audit should cover the area of business policies, process and procedures, zakat calculation and payment, contracts and agreements, and assessment of financial resource management. It is important to include these contents into Shariah audit certification.

5. Conclusion

Shariah audit certification is deemed significant to be implemented in the industry since it enhances the individuals who perform Shariah audit to demonstrate their competency and professionalism in the Shariah auditing field. It will enrich the candidates with educational experience, Shariah and auditing skills, information, and business tools that can be applied immediately in any organization or business environment. The current practice shows that IFIs conducted their own trainings related to Shariah audit. The problem is about the eligibility of the knowldege and skills of the trainers that conduct trainings in Shariah audit. Therefore certification is required.

The results indicate that Shariah audit certification should at least cover the scope of Shariah audit outlined by BNM since it is considered sufficient for Shariah audit. Shariah auditors should also be equipped with knowledge of financial statements and internal control systems of an Islamic bank. More than that, the results suggest that the extended contents in Shariah audit should include the area of business policies, process and procedures, zakat calculation and payment, contracts and agreements, and assessment of financial resource management. It is important to include these contents into Shariah audit certification. This study is expected to contribute to the idea of the contents for Shariah audit certification program to be conducted by the industry association, with collaboration with universities. This certification will also give impact on Shariah audit practices in IFIs. This study can be expanded for future research focusing on the organization which should authorize the certification.

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Analysis of Financial Intermediation and Profitability: "A Case Study of the Ghanaian Banking Industry"

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Abstract

The study examines the extent to which banks in Ghana have performed their financial intermediation function and its implication for profitability. Secondary data which was solicited from the Headquarters of the eight largest banks in Ghana was obtained from their financial reports from 2004 to 2010. Using descriptive examination technique, it is observed that all the banks performed creditably well within the period under study though the private banks performed better than the state-owned banks. Additionally, on the average, banks that mobilized the most deposits were also the ones that recorded most loans and advances. Interestingly, the study finds however that banks that made the most loans and advances were not necessarily those that made most profits. It is recommended that to remain profitable in the banking business in Ghana, management must not only put strategies in place to mobilize deposits and make out loans and advances but also institute procedures to efficiently manage cost. Furthermore, government must also put policies in place to motivate banks mobilize more deposits and make out more loans to deepen the financial system.

Keywords: banks, deposits, loans and advances, profitability, economic growth, cost management

1. Introduction

Financial intermediation basically involves deposit mobilisation from the surplus units of an economy and channelling those funds as loans and advances to the deficit units of the economy thus, allowing for efficient allocation of financial resources in the financial system. For the banking sector to remain profitable, Obamuyi (2013) argues that banks must efficiently mobilise more deposits to enable them grant more loans and advances. This means that there exist an association between deposits mobilisation and bank lending. Furthermore, Vohra and Sehgal (2012) posit that the ability of banks to perform this function efficiently has implications for their profitability. The finance literature additionally provides another strand of argument in support of the view that countries with efficient financial systems grow faster, while inefficient financial systems stand the perils of bank failures and lags behind in economic growth and development (Shaw, 1973; Kasekende, 2008; Northcoth, 2004). The authors further observe that the efficiency of a financial system is determined by the cost and speed with which deposits are mobilised and credit facilities extended to customers.

From the beginning of 1980s, governments of most developing economies started implementing major reforms aimed at revitalising their financial systems in order to achieve economic development. Empirical studies conducted several years later to assess the efficacy of these reforms appear to have shown mixed results. For example, Obamuyi (2013) relates that the financial system of most developing countries still remain largely under developed and thus needed to be revitalised to stimulate the needed economic growth and development. Additionally, Mohammed (2006) observed that the financial systems in most developing countries are vastly fragmented, inefficient, and uncompetitive. Alternatively, similar studies conducted in developed economies generally demonstrated that indeed increased and efficient financial intermediation leads to bank profitability, stability and economic development.

To deepen the financial system in Ghana, several financial and economic reforms were implemented since 1983. For example, the famous FINSAP 1 & II under the Economic Recovery Programme was implemented in Ghana in the 1980s to revitalise the financial system to motivate economic growth and development. Intriguingly, several years after the implementation of these reforms in Ghana, formal evidence-base studies that specifically examine the association among deposit mobilisation, lending activity, and bank profitability are rare. This study

therefore attempts to fill this gap by using a descriptive methodology technique to investigate these relationships. Broadly, the study aims at investigating the extent to which banks have performed their financial intermediation function in Ghana. Specifically, the study will first examine the effectiveness and extent to which banks have mobilised deposits and grant-out loans and advances to their customers and secondly, to assess whether there are any relationship between these and profitability of the banks.

To achieve the objectives of the study, the following questions are posed: Firstly, what is the extent and efficiency of deposit mobilisation of banks in Ghana? Secondly, is there any trend in the deposit mobilisation and granting of loans and advances of banks in Ghana? Thirdly, is there any trend between the deposit mobilisation, lending activity and bank profitability in Ghana? The relevance of this study is threefold. First, it may enhance decision making at bank managerial level on issues about efficiency in financial intermediation and profitability which are critical issues in ensuring financial system stability, and economic growth and development; Second, the findings may guide government in formulating policies on financial intermediation aimed at enhancing bank financial intermediation function; and finally, the findings of this study may have pedagogical importance to academics who are endlessly finding new trends in corporate activity. The paper is divided into five sections: The next section discusses banking in Ghana. Section two considers the related literature. Section three discusses the research methodology used. Section four deals with results and discussions and the final section discuss the conclusions and recommendations of the study.

1.1 Banking in Ghana

The Ghanaian banking system consists of licensed financial institutions basically dealing in the business of banking under the banking laws of Ghana. Bank of Ghana is the central bank that governs the activities of all the financial institutions. The banking sector over the last decade has recorded significant growth and improvements in performance as a result of the Financial Sector Adjustment Programme (FINSAP I & II), Non-Performing Assets Recovery Trust (NPART) and the Foreign Exchange Bureau legislation (FEBL) reforms instituted by governments before this period. In 1989, a new Banking Law was passed and the Bank of Ghana was strengthened to enhance its capacity to play its regulatory role. These reforms and the new banking law has since strengthened the banks in terms of their capital base, managerial competence, and enhanced the supervisory proficiency of Bank of Ghana. Besides, the reforms has facilitate the improvement of the quality of assets being held by banks; built up investors confidence in the financial system and above all increased the profitability of the banks.

From 1957 to 1983, there were only twelve banks comprising of four (4) private banks and eight (8) public banks. Over the last decade and beyond, eleven (11) new banks were incorporated to do banking business in Ghana. These banks were all private except the Trust Bank (TTB) that had its major shareholder being the Social Security and National Insurance Trust (SSNIT). During this periods till date, some significant events such as the mergers (SSB and National Savings and Credit Bank), liquidation of Bank for Housing and Construction (BHC, Co-operation Banks), and privatization of state owned banks (GCB, SSB, NIB) has taken place.

The banking sector in Ghana has conventionally been segmented into commercial (retail), merchant, and developmental banks. While merchant banks have been restricted to corporate clients, the commercial and development banks have traditionally had customers across the entire financial market segments. However, since 2003, the Bank of Ghana formulated a policy issue to replace the three-pillar banking model-commercial, merchant and developmental banking with universal banking in order to provide all banks the opportunity to expand their activities, and opened up the financial system to competition, product innovation and the freedom to engage in permissible banking business without restrictions and boundaries. With improved macroeconomic conditions and prospects, the industry has grown into twenty six (26) commercial banks, diversified in geographical origin, corporate character and reach in the global financial markets. In the last decade, competition in the Ghanaian banking sector has soared over the period, with commercial and developmental banks trading beyond their perceived traditional functions and venturing into international trade financing, commerce and corporate lending, treasury services, payment financing, syndication, etc., which should have been the preserve line of business for merchant banks.

One area that has seen fierce competition in the banking industry is the area of product development. New products such as international funds transfer, school fees loan, negotiable certificate of deposit, car loans, consumer or hire purchase loans, travellers' cheques, minor savings accounts, insurance policy packages, etc. have been developed. Another improvement that has occurred over the last decade is automation and networking of branches. Almost all the banks have nationwide branch networking and this technological advancement has vastly improved banks operations and swift information processing.

Automated teller machines (ATMs) have become common giving clients the freedom to transact business at their own convenience, thus reducing bank cost of attending to many customers in the banking halls. Also electronic banking, such as telephone banking, internet banking, Short Message Service (SMS) banking etc. has been introduced. The banks have pursued consistent programmes of sponsorship, promotion, advertisement of their services and products in the published and electronic media. The Ghanaian banking sector landscape can be said to be evolving, monopolistically competitive Biekpe (2011) and promising in terms of savings mobilization, development financing and service delivery.

2. Literature Review

The theoretical underpinning of this paper is rooted in the seminal work of Shaw (1973) who argues that the financial systems in developing economies are flawed with low level of formal intermediation. Following this pioneering paper, several empirical works have been carried out to investigate his position after most developing countries have taken conscious steps to liberalise their financial systems.

Basically, a true liberalised financial system is the one in which enough deposits are efficiently mobilised and sufficient loans and advances granted to credit worthy customers couple with the "independence" of the financial system from government interference. Generally, loans or "credit" constitutes the largest single income-earning asset in the portfolio of most banks. According to (Carletti, 2004), this explains why banks spend substantial resources to estimate, monitor and manage credit quality. Nonetheless, it is important for us to observe that a bank's lending capacity and financial success is largely dependent on its ability to mobilise enough deposits. Shaw (1973) and McKinnon (1973) find that this financial intermediation activity has implication for economic development of nation. Besides, we must however recognise that several factors influence this intermediation process thereby preventing the financial system from operating at its optimal level.

While investigating factors that affect lending rates, degree of lending volume and collateral setting in the loan decision making of Thai banks, Suwanaporn (2004) observes that Thai banks' lending decisions have sufficient systematic structures in place, which is not chaotic as speculated by many. Additionally, Thai banks partly consider borrower's risk in their lending decision, especially the degree of lending volume but do not make use of these risk indicators in the pricing of the loans. The author thus stressed that Thai banks need to be more careful with their loan pricing decisions so as to prevent bad loans. This implies that 'loan mispricing' emanating from not fully incorporating the risk associated with lending volumes into lending rates and other customer risk factors may have negative consequences for the financial intermediation process, bank profitability, financial system instability and economic decay.

In a recent study, Obamuyi (2013) reaffirms that banks with high deposits and loans perform better in terms of profitability than banks with low deposits and loans. The author suggested that, since high deposits and loans enhance profitability, policy makers must make savings attractive in order to positively influence the liquidity position of the banks and their lending behaviour. The author further argues that, Nigerian commercial banks observed an era of remarkable profitability, characterized by high competition, huge deposits and varied investment opportunities. This development in the banking industry suggests that banks with well efficient deposits mobilization drive with high-quality lending behaviour will be the most profitable.

In a similar study, Haron and Azmi (2006) investigated the structural determinants of deposits level of commercial banks in Malaysia using co-integration technique. The study discover that the major determinants of deposit levels of Malaysian Commercial banks include: deposit rate of interest, base lending rate, Kuala Lumpur Composite Index, Money supply and Gross Domestic Product. The authors further establish that in most cases, bank customers behave in conformity with the saving behaviour theory which has implications for lending activity and profitability.

In addition, Okoye and Onyekachi (2013) examine the effects of lending rate and monetary policy rate on the financial performance of Banks in Nigeria. They observed that, lending rate and monetary policy rate both had a significant and positive effect on the financial performance of Nigerian deposit money banks. The authors relate that since lending is irrefutably the engine of the banking business, its administration which requires sufficient deposit mobilisation and cost reduction strategies must rigorously be pursued to achieve profitability, financial stability and economic development. The findings suggest that deposit mobilisation is at the heart of banks' lending activity and financial success among other things.

In a study of the link between monetary policy and banks lending behaviour in Ghana, Amidu (2006) observed that, Ghanaian banks' lending behaviour is affected significantly by the country's economic activities and changes in money supply. The results of his study also support previous studies that the central bank's prime rate and inflation negatively but insignificantly affect banks lending. With the firm level characteristics, the study

reveals that bank size and liquidity significantly influence banks' ability to extend credit. Since deposits and its effective management are critical for resilient liquidity position of banks, it presupposes that sufficient deposit levels and prudent lending behaviour are keys for banks' profitability with its associated consequences for financial stability and economic development.

According to Vohra and Sehgal (2012) sufficient deposit mobilization and careful lending behavior are the two most important functions of banks since their profitability and survival depend on these. The authors noted that interest income constitutes the single most important part of banks profit. It is therefore clear that high deposit levels and prudent credit behavior are critical factors for bank profitability, financial system stability and economic development.

Finally, since the profitability and survival of businesses depend largely on availability of funds, and deposits constitute the major source of bank financing, it is apparent that there exist a relationship among efficient deposit mobilization, bank lending behavior, and profitability (Bologna, 2011). This explains why most banking firms have put in place aggressive deposit mobilization strategies with focus on customer need identification and offering of sophisticated banking products.

3. Research Methodology

The primary purpose of this paper is to examine the efficiency with which banks in Ghana mobilizes deposits and advances loans to their customers with the view of making profit. In his seminal work, Shaw (1973) argued that for the financial system to function smoothly, banks have a primary responsibility to efficiently mobilize funds from the surplus unit of the economy and reallocate it to the deficit unit of the economy. Secondary data which spanned from 2004 to 2010 was obtained from the annual reports of the eight largest Ghanaian banks in terms of total assets and was solicited from the headquarters of the selected banks. These banks include: Ghana Commercial Bank (GCB), Standard Chartered Bank (SCB), Barclays Bank Ghana Ltd. (BBGL), Ecobank Ghana (EBG), Agricultural Development Bank (ADB), Stanbic Bank (STANBIC), Merchant Bank Ghana (MBG), and National Investment Bank (NIB). According to the Ghana Banking Survey (2012), over 70% of the Ghanaian bankable population is served by these banks hence their relative importance in terms of total assets and country presence. The study period has been chosen with the recognition that it cuts-across two political administrations. The relevance of this is that, it eliminates any special regulatory privileges or otherwise that may be associated with a particular political regime and which could thus influence the results.

Following Obamuyi (2013), the study uses descriptive statistics involving tables and bar graphs while employing time trend analysis, averages and percentage growth to investigate the financial intermediation function and profitability of the above selected banks in Ghana.

4. Results and Discussions

4.1 Analyses of the Deposits of the Selected Banks

Table 1 below shows the deposits of the selected eight banks from 2004–2010. It is observed that total deposits mobilized by the banks at the end of 2004 amounted to Gh¢1,516,308,059.00. However, by the end of 2010, this figure rose to Gh¢7,322,893,388.00 giving a large percentage increase of 382.9% whiles the combine average deposit of the banks stood at Gh¢490,443,795.00 for the period under study. Table 1 further revealed that, comparatively, GCB mobilized the highest average deposits for the years under review, followed by BBGL, SCB, EBG, MBG, ADB, STANBIC, and finally NIB in that order. This tremendous performance of the banks in deposits mobilization firstly may be associated with higher deposits rate the country has seen during the study period relative to previous years. Secondly, it may also be attributed to increase customer education to save and also due to the relative stability of the cedi during the period under investigation. Furthermore, Table 2 and Figure 1 below revealed that deposit mobilization of all the individual banks had increased in absolute terms for the period under study. Nonetheless, performance of the banks in terms of their market share in deposit mobilization has rather been mixed.

For Ghana Commercial Bank Ltd. (GCB), total deposits mobilized at the end of 2004 stood at Gh¢426,753,788.1; representing 28.1% of total deposits of the selected banks for 2004 (see Table 2 and Figure 1 below). This amount increased to Gh¢1,575,281,050.00 by the end of 2010 and constitutes 21.5% of total deposits of the selected banks for that year. This suggests that, there was an increase of 269.1% in GCB's deposit mobilization in absolute terms between 2004 and 2010 although its market share in total deposit mobilization fell by 6.6% for the same period under review.

Also, at the end of 2004, Standard Chartered Bank Ghana Ltd. (SCB) mobilized a total deposit of Gh¢330,664,508.3; representing 21.8% of total deposits of the selected banks for 2004. This amount increased to

Gh₵1,092,638,000.00 by the end of 2010 and constitutes 14.9% of total deposits of the selected banks for that year. This means that, there was an increase of 230.4% in SCB's deposit mobilization in absolute terms between 2004 and 2010 although its market share in total deposit mobilization fell by 6.9% for the same period under review.

Furthermore, at the end of 2004, Barclays Bank Ghana Ltd. (BBGL) mobilized a total deposit of Gh₵280,265,201.7; representing 18.5% of total deposits of the selected banks for 2004. This amount increased to Gh₵1,093,655,000.00 by the end of 2010 and constitutes 14.9% of total deposits of the selected banks for that year. This implies that, there was an increase of 290.2% in BBGL's deposit mobilization in absolute terms between 2004 and 2010 although its market share in total deposit mobilization fell by 3.6% for the same period under review.

In addition to the above, at the end of 2004, Agricultural Development Bank (ADB) mobilized a total deposit of Gh₵161,784,764.4; representing 10.7% of total deposits of the selected banks for 2004. This amount increased to Gh₵536,079,338.00 by the end of 2010 and constitutes 7.3% of total deposits of the selected banks for that year. The implication is that, there was an increase of 231.4% in ADB's deposit mobilization in absolute terms between 2004 and 2010 although its market power in total deposit mobilization fell by 3.4% for the same period under review.

The fall in market power in total deposit mobilization of all the banks above (GCB, SCB, BBGL, and ADB) for the period under review may be attributed to the entry of foreign banks (Fidelity Bank, Guaranty Trust Bank, United Bank of Africa, UT Bank among others) into the Ghanaian banking industry which has since increased competition monopolistically in the sector (Biekpe, 2011). For example, it has been observed that the new banks have adopted more aggressive deposit mobilization strategies relative to most existing banks. Given that the Ghanaian bankable population is small and increasing at a decreasing rate relative to the emergence of new banks, the deposit clientele base of the existing banks is bound to dwindle.

For Ecobank Ghana Ltd. (EBG), deposits mobilized at the end of 2004 stood at Gh₵136,138,898.7; representing 9% of total deposits of the selected banks for 2004. This amount increased to Gh₵1,086,935,000.00 by the end of 2010 and constitutes 14.8% of total deposits of the selected banks for that year. This implies that, there was a remarkable increase of 698.4% in EBG's deposit mobilization in absolute terms between 2004 and 2010 with its market share in total deposit mobilization increasing by 5.8% for the same period under review.

Deposits mobilized by Stanbic Bank Ghana Ltd. (STANBIC) at the end of 2004 stood at Gh₵52,472,461.2; representing 3.5%% of total deposits of the selected banks for 2004. This amount increased to Gh₵728,372,000.00 by the end of 2010 and constitutes 9.9% of total deposits of the selected banks for that year. This gives an incredible increase of 1,288.1% in STANBIC's deposit mobilization in absolute terms between 2004 and 2010 with its market share in total deposit mobilization increasing by 6.4% for the same period under review.

For Merchant Bank Ghana (MBG), deposits mobilized at the end of 2004 was Gh₵91,563,551.99; representing 6% of total deposits of the selected banks for 2004. This amount increased to Gh₵711,130,000.00 by the end of 2010 and constitutes 9.7% of total deposits of the selected banks for that year. This gives a significant increase of 676.7% in MBG's deposit mobilization in absolute terms between 2004 and 2010 with its market share in total deposit mobilization increasing by 3.7%% for the same period under review.

Lastly, National Investment Bank (NIB) had a deposit of Gh₵36,664,884.3 at the end of 2004; representing 2.4% of total deposits of the selected banks for 2004. This amount increased to Gh₵498,803,000.00 by the end of 2010 and constitutes 6.8% of total deposits of the selected banks for that year. This gives a considerable increase of 1260.4% in NIB's deposit mobilization in absolute terms between 2004 and 2010 with its market share in total deposit mobilization increasing by 4.4% for the same period under review.

The increases in market power in total deposit mobilization of EBG, STANBIC, MBG, and NIB during the period under examination may be associated with a more intensive deposit mobilization policy being pursued by these banks relative to their four competitors discussed earlier.

Table 1. Deposits of the selected banks from 2004–2010 in Cedis (GH₵)

BANK	2004	2005	2006	2007	2008	2009	2010	Average
GCB	426753788	491473000	634572700	839382573	1030106198	1259470137	1575281050	893862778
SCB	330664508	328780000	466324000	578751000	752308000	844519000	1092638000	627712073
BBGL	280265202	334877000	489738000	720040000	923858000	933888000	1093655000	682331600
EBG	136138899	178178000	335637000	437950000	682705000	862810000	1086935000	531479128
ADB	161784764	162159000	234414300	271024641	319499930	425144815	536079338	301443827

STANBIC	52472461	69312000	1160793	266201000	369905000	590976000	728372000	296914179
MBG	91563552	69312000	275830000	401498000	366024000	611686000	711130000	361006222
NIB	36664884	60798000	169754000	244583000	254283000	336718000	498803000	228800555
Total	1516308059	1694889000	2607430793	3759430214	4698689128	5865211952	7322893388	3923550362
AVERAGE								490443795

Source: Authors' Compilation from the Annual Reports of the Selected Banks (2004–2010).

Note. Percentage increase in deposits of the selected banks from 2004–2010 = 382.9%

Table 2. Comparative analysis of deposits of the selected banks in Gh¢ (2004–2010)

BANK	2004	% of Total	2010	% of Total
GCB	426753788.1	28.14426697	1575281050	21.51172995
SCB	330664508.3	21.80721169	1092638000	14.92085085
BBGL	280265201.7	18.48339459	1093655000	14.9347388
EBG	136138898.7	8.978313999	1086935000	14.84297179
ADB	161784764.4	10.66965011	536079338	7.320594601
STANBIC	52472461.2	3.460540943	728372000	9.946505587
MBG	91563551.99	6.038585066	711130000	9.711052207
NIB	36664884.3	2.418036631	498803000	6.811556219
Total	1516308059		7322893388	

Source: Authors' Compilation from the Annual Reports of the Selected Banks (2004–2010).
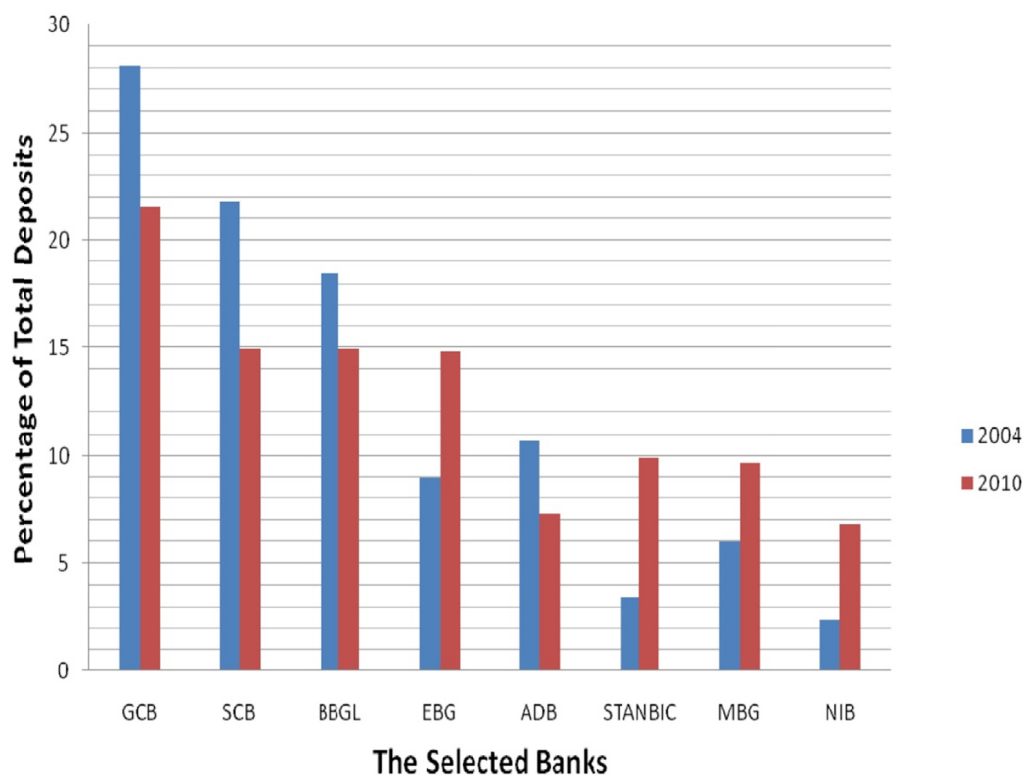
Figure 1. Deposit behaviour of the selected banks (2004 and 2010)

4.2 Analyses of the Loans and Advances of the Selected Banks

Table 3 below shows the loans and advances of the selected eight banks from 2004–2010. It is observed that total loans and advances mobilized by the banks at the end of 2004 amounted to Gh¢813,092,345.1. Nonetheless, by the end of 2010, this figure rose to Gh¢4,297,525,326.00 indicating a percentage increase of 428.5% whiles the combined average loans and advances of the banks stood at Gh¢322,241,490.9 for the period under investigation. Table 3 further shows that, relatively, GCB made the highest average loans and advances for the study period,

followed by BBGL, EBG, MBG, ADB, SCB, STANBIC, and finally NIB in that order. This significant improvement in granting out loans and advances within the study period may be attributed to increase competition in the Ghanaian banking sector for increase customer base. It may also be associated with the expansion in the Ghanaian economy which has since propelled demand for loans and advances. One key observation from the study is that, generally, apart from SCB, banks which mobilized relatively higher average deposits appears to have granted most loans and advances on average. Additionally, Table 4 and Figure 2 below show that loans and advances of all the individual banks had improved in absolute terms for the period under examination. Nonetheless, performance of the banks in terms of market share in granting out loans and advances has rather been mixed.

In the case of GCB, total loans and advances at the end of 2004 stood at Gh¢202,373,587.1; indicating 24.9% of total loans and advances of the selected banks for 2004 (see Table 4 and Figure 2 below). This amount increased to Gh¢1,003,682,422.00 by the end of 2010 and constitutes 23.4% of total loans and advances of the banks for that year. This gives an increase of 396% in GBC's granting of loans and advances in absolute terms between 2004 and 2010 though its market share in the same activity fell by 1.5% for the same period under review.

For SCB, loans and advances was Gh¢163,674,389.9 at the end of 2004; indicating 20.1% of total loans and advances of the selected banks for 2004. This amount increased to Gh¢568,182,000.00 by the end of 2010 and constitutes 13.2% of total loans and advances of the banks for that year. This gives an increase of 247.1% in SCB's granting of loans and advances in absolute terms between 2004 and 2010 though its market share in the same activity fell by 6.9% for the same period under investigation.

For BBGL, loans and advances was Gh¢206,505,649.00 at the end of 2004; indicating 25.4% of total loans and advances of the selected banks for 2004. This amount increased to Gh¢435,918,000.00 by the end of 2010 and constitutes 10.1% of total loans and advances of the banks for that year. This gives an increase of 111.1% in BBGL's granting of loans and advances in absolute terms between 2004 and 2010 though its market share in the same activity fell by 15.3% for the same period under examination.

In the same vein, NIB's loans and advances was Gh¢77,711,935.6 at the end of 2004; indicating 9.6% of total loans and advances of the selected banks for 2004. This amount increased to Gh¢326,977,000 by the end of 2010 and constitutes 7.6%% of total loans and advances of the banks for that year. This gives an increase of 320.76% in NIB's granting of loans and advances in absolute terms between 2004 and 2010 though its market share in the same activity fell by 2% for the same period under evaluation.

Despite the fact that GCB, SCB, BBGL, and NIB have all performed creditably well in absolute terms in granting loans and advances over the study period, the fall in their market power in the same activity over the same period may be attributed to increase competition in the Ghanaian banking sector as indicated above and also possibly the relatively higher lending rates charged by these banks which may deter many customers from borrowing from these institutions. Distinctively, the enormous fall in BBGL's market power in granting loans and advances for the study period (though the second highest in granting loans and advances in absolute terms) may also be associated with the bank's conservative lending policies. The fact is that, on average, doubtful debt accounts in the Ghanaian banking sector has exacerbated since the advent of foreign banks into the Ghanaian banking scene (Ghana Banking Survey, 2009).

In the case of EBG, loans and advances was Gh¢69,548,073.81 at the end of 2004; indicating 8.6% of total loans and advances of the selected banks for 2004. This amount increased to Gh¢495,691,000.00 by the end of 2010 and constitutes 11.5% of total loans and advances of the banks for that year. This gives an increase of 612.7% in EBG's granting of loans and advances in absolute terms between 2004 and 2010 with an increased market power in the same activity by 2.9% for the same period under assessment.

Total loans and advances of ADB stood at Gh¢8,349,285.5 at the end of 2004; indicating 1.0% of loans and advances of the selected banks for 2004. This amount increased to Gh¢576,986,904.00 by the end of 2010 and constitutes 13.4% of total loans and advances of the banks for that year. This gives a remarkable increase of 6810.6% in ADB's granting of loans and advances in absolute terms between 2004 and 2010 with an increased market power in the same activity by 12.4% for the same period under assessment.

For STANBIC, total loans and advances was Gh¢19,955,290.8 at the end of 2004; indicating 2.5% of loans and advances of the selected banks for 2004. This amount increased to Gh¢441,734,000.00 by the end of 2010 and constitutes 10.3% of total loans and advances of the banks for that year. This gives a significant increase of 2113.6% in STANBIC's granting of loans and advances in absolute terms between 2004 and 2010 with an increased market power in the same activity by 7.8% for the same period under appraisal.

Last but not the least, MBG recorded Gh¢64,974,133.4 in total loans and advances at the end of 2004; indicating 8%

of loans and advances of the selected banks for 2004. This amount increased to Gh¢448,354,000.00 by the end of 2010 and constitutes 10.4% of total loans and advances of the banks for that year. This gives an increase of 590.0% in MBG's granting of loans and advances in absolute terms between 2004 and 2010 with an increased market power in the same activity by 2.4% for the same study period.

The absolute increases in loans and advances couple with increases in market power of EBG, ADB, STANBIC, and MBG for the study period may be attributed to their aggressive lending strategies and comparatively lower lending rates. In Ghana, it is not uncommon to see casual employees of these banks moving from office to office and selling their bank's loan products to potential customers. Specifically, ADB has out-performed all the other seven selected banks in granting loans and advances in both absolute terms and average market power (6810.6% and by 12.4% respectively) for the period under investigation. This may be attributed to successive government's Special Directive to the bank to extend more credit facility to the agricultural sector (mainly cocoa production, fishing, and animal husbandry) to boost production and generate employment in the country.

Table 3. Loans and advances of the selected banks from 2004–2010 in Cedis (GH¢)

BANK	2004	2005	2006	2007	2008	2009	2010	Average
GCB	202373587.1	322166000	364538500	742696325	1087118928	1265516727	1003682422	712584641.3
SCB	163674389.9	172680000	87402000	93861000	153776000	480613000	568182000	245741198.6
BBGL	206505649	268335000	362980000	640558000	718598000	513717000	435918000	449515949.9
EBG	69548073.81	103124000	162245000	285772000	401531000	448463000	495691000	280910582
ADB	8349285.5	109115000	150923300	150923300	370606658	372864956	576986904	248538486.2
STANBIC	19955290.8	26684000	722125	241277000	287717000	345635000	441734000	194817773.7
MBG	64974133.4	98756000	218482000	294260000	308407000	336546000	448354000	252825590.5
NIB	77711935.6	88906000	137736000	194933000	240232000	284488000	326977000	192997705.1
Total	813092345.1	1189766000	1485028925	2644280625	3567986586	4047843683	4297525326	2577931927
AVERAGE								322241490.9

Source: Authors' Compilation from the Annual Reports of the Selected Banks (2004–2010).

Note. Percentage increase in loans and advances of the selected banks from 2004–2010=428.5%.

Table 4. Comparative analysis of loans and advances of the selected banks in Gh¢ (2004–2010)

BANKS	2004	% of Total 2004	2010	% of Total 2010
GCB	202373587.1	24.88937306	1003682422	23.35489255
SCB	163674389.9	20.12986482	568182000	13.22114373
BBGL	206505649	25.39756403	435918000	10.14346553
EBG	69548073.81	8.553527066	495691000	11.53433575
ADB	8349285.5	1.02685575	576986904	13.42602685
STANBIC	19955290.8	2.454246547	441734000	10.27879923
MBG	64974133.4	7.990990666	448354000	10.43284137
NIB	77711935.6	9.557578062	326977000	7.60849501
Total	813092345.1		4297525326	

Source: Authors' Compilation from the Annual Reports of the Selected Banks (2004 – 2010).
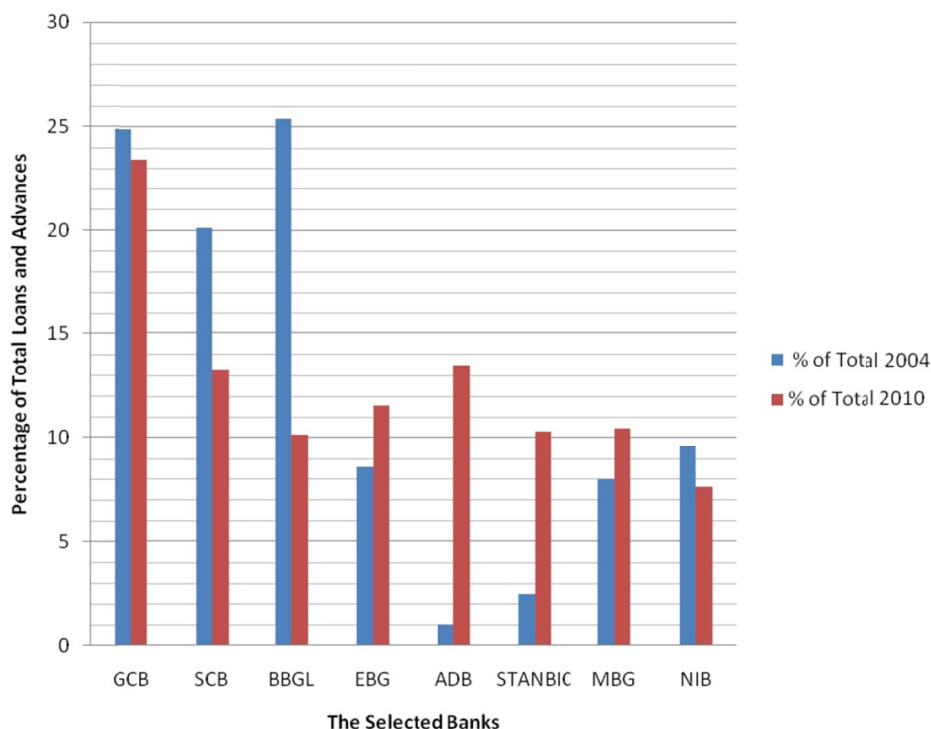
Figure 2. Behaviour of loans and advances of the selected banks (2004 and 2010)

4.3 Analyses of Profits of the Selected Banks

Table 5 below indicates the profit behavior of the selected eight banks from 2004–2010. It is observed that total profits mobilized by the banks at the end of 2004 amounted to Ghȼ82,300,388.9. However, by the end of 2010, this figure rose to Ghȼ304,755,333.00 indicating a percentage increase of 270.3% whiles the combined average profit of the banks stood at Ghȼ18,864,780.00 for the period under examination. Table 5 further shows that, relatively, SCB made the highest average profits for the study period, followed by EBG, GCB, BBGL, STANBIC, ADB, MBG, and finally NIB in that order. This improvement in the profit performance of the banks within the study period may be attributed generally to relatively higher lending rates compared to previous years, the significant increase in deposits mobilized within the period under study (382.9%), and also relatively increase business activity within the Ghanaian economy for the period under investigation due to stability in inflation.

An important observation in the profit performance of the banks lies in the fact that, generally, banks which recorded the highest profits were not necessarily the ones which made out most loans and advances and vice versa. For example, Table 3 shows that GCB and BBGL were the first and second respectively to have granted out most loans and advances on average within the study period but placed third and fourth respectively in average profit performance according to Table 5. Another example is that, SCB which was the sixth highest out of the eight banks in granting out loans and advances on average turns out to be the most profitable bank for the period under examination. A plausible reason may be due to prudent cost management strategies being adopted by SCB. A significant observation in Ghanaian banking is that, almost all the banks do "high street" banking and operate from luxurious premises couple with comparatively high salaries they pay to their employees in the name of poaching them from their previous employers. These activities obviously will have implication for increased cost of doing business with its attendant problems and thus must be checked. Furthermore, Table 6 and Figure 3 below show that besides NIB, the profit performance of all the individual banks had improved in absolute terms for the period under examination. Nevertheless, the performance of the banks in terms of their relative profit has rather been mixed.

For GCB, total profits at the end of 2004 stood at Ghȼ17,793,450.1; representing 21.6% of total profits of the selected banks for 2004 (see Table 6 and Figure 3 below). This amount increased to Ghȼ55,432,230.00 by the end of 2010 and constitutes 18.2% of total profits of the selected banks for that year. This implies that, there was an increase of 211.5% in GCB's profit in absolute terms between 2004 and 2010 although its share of relative profit fell by 3.4% for the same period under review.

For BBGL, total profits at the end of 2004 stood at Ghȼ27,791,618.3; representing 33.8% of total profits of the

selected banks for 2004. This amount increased to Gh¢59,244,000.00 by the end of 2010 and constitutes 19.4% of total profits of the selected banks for that year. The implication is that, there was an increase of 113.2% in BBGL's profit in absolute terms between 2004 and 2010 although its share of relative profit fell by 14.4% for the same period under evaluation.

Similarly, MBG total profits at the end of 2004 stood at Gh¢3,356,411.00; representing 4.1% of total profits of the selected banks for 2004. This amount increased to Gh¢4,629,000.00 by the end of 2010 and constitutes 1.5% of total profits of the selected banks for that year. The implication is that, there was an increase of 37.9% in MBG's profit in absolute terms between 2004 and 2010 although its share of relative profit fell by 2.6% for the same period under evaluation.

In the same way, NIB's total profits at the end of 2004 stood at Gh¢6,810,666.4; representing 8.3% of total profits of the selected banks for 2004. This figure fell to Gh¢2,424,000.00 by the end of 2010 and constitutes 0.8% of total profits of the selected banks for that year. This led to a decrease of 64.4% in NIB's profit in absolute terms between 2004 and 2010 couple with the fact that its share of relative profit also fell by 7.5% for the same period under assessment.

The fall in relative profit share of GCB, BBGL, MBG, and NIB between 2004–2010 may be associated with increase competition in the Ghanaian banking industry (Biekpe, 2011 and Ghana Banking Survey, 2009) which has since been narrowing the margins, couple with the increasing cost of doing the business of banking in Ghana (high employee salaries and operating from luxurious premises as indicated earlier, and increasing utility bills). Specifically, the decline in the profit performance of NIB and the abysmal profit performance of MBG over the study period is not surprising as it is evident that these banks, being state-owned constantly suffer from the "interference" of politicians.

For SCB, total profits at the end of 2004 stood at Gh¢16,847,444.3; representing 20.5% of total profits of the selected banks for 2004. This amount increased to Gh¢72,208,000.00 by the end of 2010 and constitutes 23.7% of total profits of the selected banks for that year. This suggests that, there was an increase of 328.6% in SCB's profit in absolute terms between 2004 and 2010 with an increase in its share of relative profit going up by 3.2% for the same period under examination.

Also, EBG had a total profit of Gh¢8,050,971.81 at the end of 2004; representing 9.8% of total profits of the selected banks for 2004. This amount increased to Gh¢58,604,000.00 by the end of 2010 and constitutes 19.2% of total profits of the selected banks for that year. This means that, there was an increase of 627.9% in EBG's profit in absolute terms between 2004 and 2010 with an increase in its share of relative profit going up by 9.4% for the same period under review.

Likewise, ADB had a total profit of Gh¢125,109.48 at the end of 2004; representing 0.15% of total profits of the selected banks for 2004. This amount increased to Gh¢33,215,103.00 by the end of 2010 and constitutes 10.9% of total profits of the selected banks for that year. This means that, there was a tremendous increase of 26,448.8% in ADB's profit in absolute terms between 2004 and 2010 with an increase in its share of relative profit going up by 10.75% for the same period under study.

Finally, STANBIC bank had a total profit amounting to Gh¢1,524,717.5 at the end of 2004; representing 1.9% of total profits of the selected banks for 2004. This amount increased to Gh¢18,999,000.00 by the end of 2010 and constitutes 6.2% of total profits of the selected banks for the period under review. This means that, there was a remarkable increase of 1,146.1% in STANBIC's profit in absolute terms between 2004 and 2010 with an increase in its share of relative profit going up by 4.3% for the same period under assessment.

The increases in both the absolute amounts and the relative market share in the profit performance of SCB, EBG, ADB, and STANBIC may be attributed to prudent management with aggressive cost cutting strategy as its centerpiece. It may also be associated with their relatively lower lending rates compared to the other banks.

Table 5. Profit behaviour of the selected banks from 2004–2010 in Cedis (GH₵)

BANK	2004	2005	2006	2007	2008	2009	2010	Average
GCB	17793450.1	12900000	25540600	24849522	37004851	18117151	55432230	27376829
SCB	16847444.3	23200000	30748000	33038000	33187000	57497000	72208000	38103635
BBGL	27791618.3	26900000	36303000	31530000	-7350000	-20291000	59244000	22018231
EBG	8050971.81	12600000	16238000	19829000	33579000	53853000	58604000	28964853
ADB	125109.482	7500000	10765000	9278832	14934890	12667366	33215103	12640900
STANBIC	1524717.5	1600000	24861281	52189490	14717000	1042000	18999000	16419070
MBG	3356411	6400000	9274000	10740000	23046000	5667000	4629000	9016058.7
NIB	6810666.4	5900000	4427000	5989000	-28574000	-22326000	2424000	3621333.4
Total	82300388.9	97000000	1.58E+08	187443844	120544741	106226517	304755333	150918244
AVERAGE								18864780

Source: Authors' Compilation from the Annual Reports of the Selected Banks (2004–2010).

Note. Percentage increase in profits of the selected banks from 2004-2010 = 270.3%.

Table 6. Comparative Analysis of Profit Behaviour of the Selected Banks in Gh₵ (2004–2010)

BANK	2004	% of Total 2004	2010	% of Total 2010
GCB	17793450.1	21.62012882	55432230	18.18909269
SCB	16847444.3	20.47067399	72208000	23.69376092
BBGL	27791618.3	33.76851395	59244000	19.43985669
EBG	8050971.81	9.78242256	58604000	19.22985216
ADB	125109.482	0.152015663	33215103	10.89894069
STANBIC	1524717.5	1.852624903	18999000	6.234181306
MBG	3356411	4.078244399	4629000	1.518923378
NIB	6810666.4	8.27537572	2424000	0.795392152
Total	82300388.89		304755333	
AVERAGE				

Source: Authors' Compilation from the Annual Reports of the Selected Banks (2004–2010).
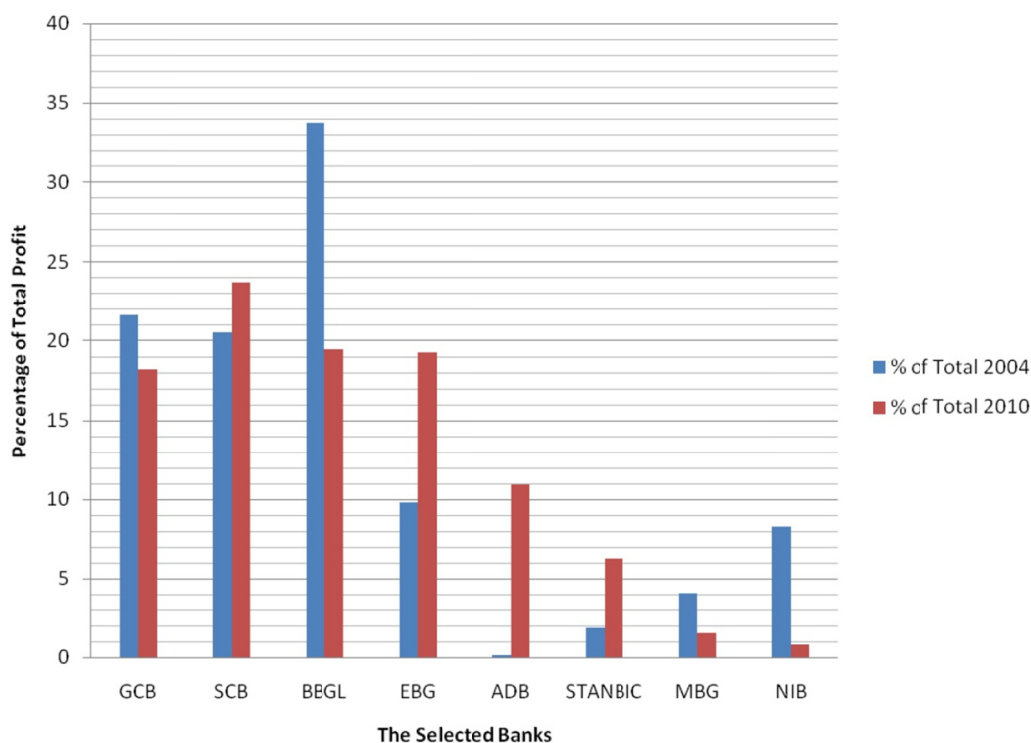
Figure 3. Profit behaviour of the selected banks (2004–2010)

5. Conclusions and Recommendations

Shaw (1973) in his seminal work argues that the extent to which banks perform their primary financial intermediation function has consequences for the economic development of their countries. Whereas empirical evidence shows that the relationship between financial intermediation and profitability of banks have focused on advanced countries with mixed findings, the relationship remains largely under studied in the developing world. Using descriptive evaluation technique, this study investigated the extent of financial intermediation and its implication for profitability in Ghanaian banking.

Generally, we observe that in the Ghanaian banking industry, the financial intermediation function has been performed creditably well over the study period given the large increases in both absolute and relative market share in deposit mobilization, granting of loans and advances, and profitability. Specifically, we noticed that on average banks which mobilized most deposits were also the ones that recorded most loans and advances and vice versa. This suggests that a bank's ability to mobilize deposits has implications for the quantum of loans and advances it can give (Jayaratne & Morgan, 1997; Obamuyi, 2013). We further discover that banks that made the most loans and advances were not necessarily those that made most profits. The implication is that besides making out loans and advances to customers, prudent cost management is also very crucial in banking in order to remain profitable. Additionally, we also report that, on average state-owned banks appears to be less efficient (except ADB) in their financial intermediation function and thus less profitable relative to the other banks.

To remain profitable in the banking business in Ghana, management must not only put strategies in place to mobilize deposits and make out loans, but also put measures in place to efficiently manage cost. Government, through the central bank monetary policy committee must put policies in place that will enable banks to mobilize more deposits. For example increasing the deposit rate and also encouraging the banks to employ new strategies to consciously mobilize deposits. Finally, Government should also avoid unnecessary interference in the management of state-owned banks so as to make them more efficient and profitable.

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Estimating the Output Gap of Pakistan on Quarterly Frequency Using Structural Methods

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Abstract

Estimates of latent macroeconomic variables like Output Gap and Potential Output have Monetary and Fiscal policy significance at high data frequency. Unlike previous, this study aims to circumvent the issue of dearth of quarterly national Income accounts for Pakistan by estimating a robust proxy for real total output based on Large Scale Manufacturing Index (LSM). This paper implements three commonly employed methods for estimating the output gap, these include; State–Space model, Wavelet filter and Structural VAR model. I conclude that in line with the macroeconomic aggregates; demand pressures in Pakistan have subsided since FY2009Q3 in addition negative output gap since 2011Q3 is due to slowdown in real economy, i.e., the aggregate supply. Lastly, I forecast that the current trend of low aggregate demand is expected to last until FY2015Q4.

Keywords: state–space models, potential output, output gap

1. Introduction

Potential output is an estimate of maximum output attainable by the economy within the existing stock of capital and labor without adding pressures on inflationary tendencies (Conway & Hunt, 1997). Estimates of output gap (i.e., deviations of Actual output from potential output) can function as useful indicator for macroeconomic policy implementation and assessment. Estimating potential output and the output gap are also useful as fiscal and monetary policies need to be aligned with the information whether the economy is above or below its sustainable long run capacity. Recent literature suggests that potential output is that level of output; where there are no excess inflationary pressures existing in the economy. In case when the output gap is positive i.e., Actual Output > Potential Output, implies that there is excess demand in the economy, and in case where output gap exhibits a negative value (i.e., Actual Output < Potential Output) it implies the existence of excess supply. In essence of Blanchard and Quah (1989) shocks to total output can be categorized as either A: Short run fluctuations (transitory) or B: Permanent (persistent) shocks, to the production capacity of the economy. From macroeconomic policy perspective it is imperative to know whether the change in output is caused by demand shocks or supply shocks or whether the economy is capable of more supply.

Economy of Pakistan since 2004 recent years has experienced persistent double digit inflation, rising unemployment and slowdown in real GDP. Only recently since Q1-FY2014Q1 economy of Pakistan has depicted signs of recovery. In this scenario it is important to estimate and analyze the short run trend of total output of Pakistan.

I aim to estimate the potential out and vis-a-viz the output gap using three methods, these are wavelet filter method, State–Space Method and Structural VAR. Resultant output gap for the period 1991Q2–2014Q1 indicate that the three methods have general coherence in estimates. I show that Pakistan economy has experienced three complete phases of positive and negative output gaps, in addition recent estimates suggest that Pakistan economy is currently experiencing recovery from extended bout of latest negative output gap. Extending our analysis I conclude using a simple ARIMA model that the recent negative output gap phase is estimated to last until FY2015Q4.

The paper is structured as follows section 2 presents relevant literature review, methodologies for estimating output gap are discussed in section 3, section 4 contains discussion on estimates and section 5 concludes.

2. Literature Review

Validity of output gap estimates in the literature build generally upon tree factors; their inflation forecasting power, Economic viability of estimates and theoretical foundation of these methods. Chagny and Lemoine (2004) note however that no definite consensus exists in favor of any one method of output gap estimation. Dennis et al (2006) declares that no single method can be unequivocally stated as the best. Billmeier (2004a) concludes in disfavor of any particular methodology where poor out-of-sample inflation forecasting is the cause of this conclusion, however in another study Billmeier (2004b) concludes univariate filter to contain better forecasting power for the case of Finland.

Development of Multivariate HP filter at the Bank of Canada and the Bank of New Zealand in the late 1990s led to conclusion of superiority of this method over simple univariate methods on two points, One, Multivariate filters as in Dupasquier et al. (1997), Conway and Hunt (1997), Coe and McDermott (1996) and Gibbs (1995) contain economic foundation for the estimation of output gap in the form of inclusion of Phillips' curve identity, secondly, These methods are shown to have good out of sample forecasting capability for inflation. Recently Benes et al. (2004) employ a modified Multivariate filter by incorporating capacity utilization, unemployment, inflation and the Real GDP to extract the output gap, they conclude robustness of these estimates by conducting this study on various countries.

Output Gap estimation a-la Blanchard and Qua (1989) led to economic theory based estimation of output gap, Structural representation of VAR is utilized by imposing long run restrictions using unemployment, inflation and total real output to estimate the potential output. Scott A (2000) and Gounder and Morling (2000) draw favorable conclusion for SVAR method in estimating output gap. Other similar studies include Billmeier (2004a), Cerra and Saxena (2000), Chantanahom et al. (2002), Dupasquier et al. (1997), Funke (1997), to name a few.

Proponents of State–Space methodology (Unobserved Components method) claim inherently viable estimation of output gap consistent simultaneous with nature of the latent variable and the estimation method. Clark (1987) and Harvey and Jaeger (1993) estimate output gap using this methodology and conclude in its favor. Recently Cayen and Van Norden (2004), Bjørnland et al. (2006), Aroujo et al. (2004), Adnan and Safdar (2008) conclude favorably for Unobserved components model in estimating output gap. It is worthwhile to note here that Unobserved components method and Multivariate HP filter method share some similar grounds as the output gap In both methods is estimated by sequentially evaluating the likelihood function using Kalman filter method (see Benes et al., 2004).

Most studies conclude that variation in estimates of output gap exist within methodologies. Coe and McDermott (1996) conclude the end-of-sample inadequate estimates of output gap for univariate methods; whereas Kalman filter based methods yield better results. Recently Bayesian methods for output gap estimation have grown in popularity (see Berger & Kemp, 2011), also in vogue recently are estimation based on theoretically sound foundations i.e., in Dynamic Stochastic General Equilibrium models; see Michel Juillard et al. (2006), Leist and Neusser (2010), Hirose and Naganuma (2009).

3. Method

Before moving on, data sets used in estimation is taken from SBP annual reports, SBP Statistical Bulletin, Planning Commission of Pakistan's Economic Survey of Pakistan (various editions). Elaborating further, a proxy series for RGDP is obtained by utilizing Large Scale Manufacturing Index (LSM) as quarterly estimates of RGDP for Pakistan are not available (see Annexure 1). Real GDP is in billions of Pakistan Rupees (PKR) adjusted for CPI inflation; base year for Real GDP is FY2006. Consumer Price Index (CPI) is taken as a gauge of Inflation in Pakistan; annual Consumer Price Index is taken on base year FY2006. Data on RGDP, CPI and Unemployment are in the range FY1991Q3–FY2014Q1.

In light of literature review I employ here three different methods for estimating the potential output and the output gap, I discuss them as under.

3.1 State Space Method

Theoretically Potential output and the output gap are latent variables that can be modeled to be extracted from the (observed) Real GDP as the trend and cyclical components of the Real GDP time series respectively. Kalman filter offers are natural and inherently suitable means to do that as Kalman filter can be seen as a means to solve for the Linear Quadratic Problem of estimating the instantaneous 'State' of a linear dynamic system perturbed by white noise, the resulting estimator is optimal statistically with respect to the quadratic function of the estimation error. In short the unobserved states can be optimally estimated through the Kalman filtering algorithm using the observed variables. Elaborating further, Kalman filter can be used to estimate unobserved

variables given that they appear as explanatory variables in a State-Space model; where a State-Space representation is one that constitutes a "measurement" equation. This equation states 'observed variables' as a function of unobserved variable(s) (also called State variable(s)) and some 'transition' equations describing the path of the unobserved variable over time.

Kalman filter can be exemplified as;

Measurement Equation:

$$Y_t = \alpha X_t + \beta Z_t + \varepsilon_t \ \ where \ \varepsilon_t \sim N(0,\delta) \tag{1}$$

Where;

Y_t: is a vector of observed variables;

X_t: is a vector of unobserved variables;

Z_t: is a vector of exogenous variables.

Transition Equation:

$$X_t = \gamma X_{t-1} + \epsilon_t \ \ where \ \epsilon_t \sim N(0,\theta) \tag{2}$$

And, γ is a vector of parameters.

The above representation may be estimated by means of a Kalman filter, a recursive procedure which, combined with a maximum likelihood estimation method, gives optimal estimates of unobserved components. State-Space models utilizing Kalman filter method to estimate Output Gap has been extensively utilized in recent years. Notable examples of Output Gap estimation are discussed in detail in Boone (2000). Also, Harvery (1985) utilizes an interesting approach by which he has employed Actual Output and Unemployment (observed variables) to estimate the potential output (unobserved variable), thus arriving at the Output Gap. This approach is consistent with the standard economics definition of the Output Gap. The methodology adopted in this manuscript is consistent with that in Harvey (1985), Watson (1986) and Vineet (2004). I incorporate a typical Phillips' curve within the Unobserved components model in order to extract the output gap. Output is modeled to be decomposed in to a trend and cycle component, where trend is modeled to be random walk with drift and cycle component is assumed as an autoregressive series. In essence of a standard Unobserved components model I present here the State and Space equations as;

$$\text{Signal Equation 1: } Y_t = Y_t^{trend} - Y_t^{cycle} \tag{3}$$

$$\text{Signal Equation 2: } \pi_t = \pi_t^* \tag{4}$$

$$\text{State Equation 1: } Y_t^{trend} = Y_{t-1}^{trend} + \mu_{t-1} + \epsilon_t \ \ where; \ \epsilon_t \ iid \sim N(0,\delta_\epsilon^2) \tag{5}$$

$$\text{State Equation 2: } \mu_t = \mu_{t-1} + \psi_t \ \ where; \ \psi_t \ iid \sim N(0,\delta_\psi^2) \tag{6}$$

$$\text{State Equation 3: } Y_t^{cycle} = \tau_1 Y_{t-1}^{cycle} + \omega_t \ \ where; \ \omega_t \ iid \sim N(0,\delta_\omega^2) \tag{7}$$

$$\text{State Equation 4: } \pi_t = \tau_2 \pi_{t-1} + \tau_2 \pi_t^* + \tau_3 Y_{t-1}^{cycle} + \varphi_t \ \ where; \ \varphi_t \ iid \sim N(0,\delta_\varphi^2) \tag{8}$$

Where;

Y_t: Log of Real GDP.

Y_t^{trend}: Trend component of Real GDP.

Y_t^{cycle}: Cyclical Component of Real GDP (assumed to be AR(1) process).

π_t: CPI Inflation.

π_t^*: Target Inflation.

μ_t: The drift component of trend RGDP is assumed to be an arbitrary constant.

Parameters of the above equations are estimated by sequentially evaluating the Likelihood function using the Kalman filtering methodology (see Grewal & Andrews, 2001 for theoretical underpinning of Kalman filtering). Figure 1 depicts Potential Output estimates in comparison with RGDP.
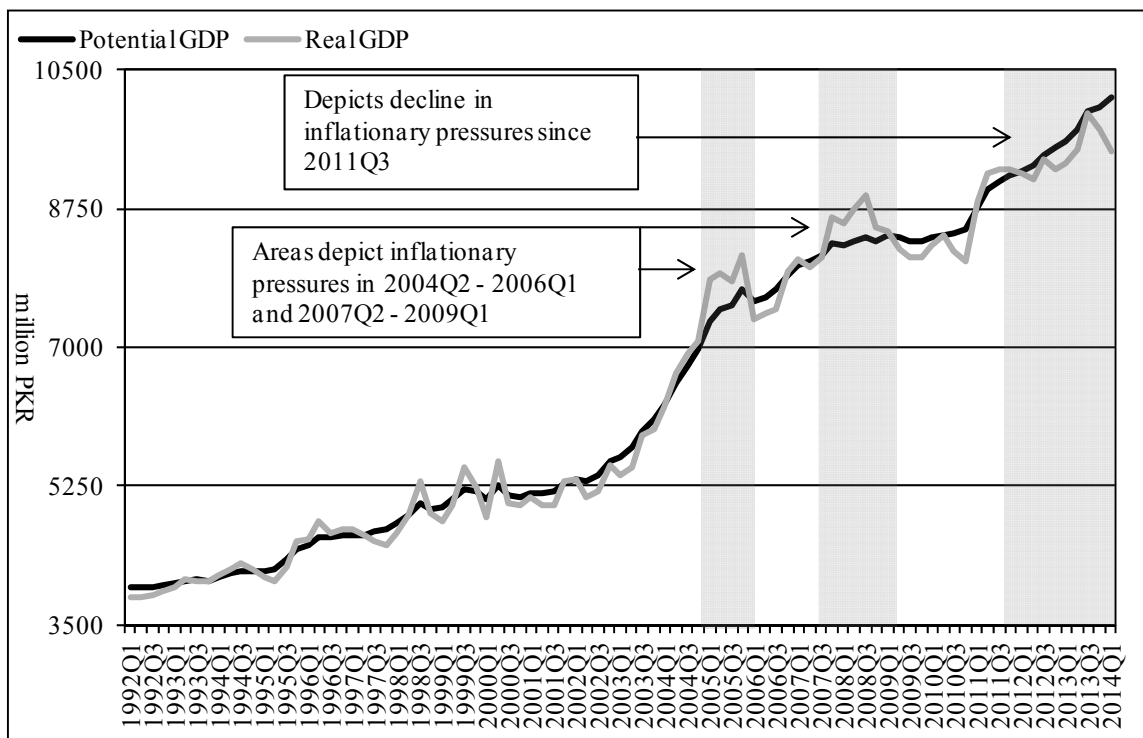
Figure 1. Real GDP and potential GDP on quarterly frequency for Pakistan, state–space method

3.2 Structural Vector Autoregression (SVAR) Method

In line with Bjørnland et al. (2006), I estimate a three variable SVAR; I implement long run restrictions consistent with Blanchard and Quah (1989). Where, Blanchard and Quah (1989) use long run restrictions on a two variable model in VAR methodology by subjecting it to structural constraints in order to draw long run (permanent) shocks and short run (transitory) shocks to the system. As at high data frequency like in quarterly Real GDP short run is characterized by the assumption of constant stock of factors of production, constant habits and constant productivity, any transitory or short run shocks can be interpreted as emanating from aggregate demand side of the economy. Whereas in the long run stock of factors of production, habits, expectations, productivity and technology are all assumed to be dynamic, therefore persistent shocks can be interpreted as emanating from the aggregate supply or real economy.

I specify 3 variables VAR ordered as Unemployment, Real GDP and CPI Inflation along with the structural restrictions as below;

$$\Delta u_t = \sum_{K=0}^{\infty} A_{11}(K)\varepsilon 1_{t-k} + \sum_{K=0}^{\infty} A_{12}(K)\varepsilon 2_{t-k} + \sum_{K=0}^{\infty} A_{13}(K)\varepsilon 3_{t-k} + \psi_u \tag{9}$$

$$\Delta y_t = \sum_{K=0}^{\infty} A_{21}(K)\varepsilon 1_{t-k} + \sum_{K=0}^{\infty} A_{22}(K)\varepsilon 2_{t-k} + \sum_{K=0}^{\infty} A_{23}(K)\varepsilon 3_{t-k} + \psi_y \tag{10}$$

$$\pi_t = \sum_{K=0}^{\infty} A_{31}(K)\varepsilon 1_{t-k} + \sum_{K=0}^{\infty} A_{32}(K)\varepsilon 2_{t-k} + \sum_{K=0}^{\infty} A_{33}(K)\varepsilon 3_{t-k} + \psi_\pi \tag{11}$$

Or;

$$\begin{bmatrix} \Delta u \\ \Delta y \\ \pi \end{bmatrix}_t = \begin{bmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) \\ A_{31}(L) & A_{32}(L) & A_{33}(L) \end{bmatrix} \begin{bmatrix} \varepsilon 1 \\ \varepsilon 2 \\ \varepsilon 3 \end{bmatrix} + \begin{bmatrix} \psi_u \\ \psi_y \\ \psi_\pi \end{bmatrix}_t \tag{12}$$

Where, $[\psi_u \quad \psi_y \quad \psi_\pi]'$ is vector of deterministic trend, $A_{ii}(L)$ is notification for lag operator which is determined using; $E(\varepsilon_t \varepsilon_t') = I$, as the shocks are not observable, I estimate VAR of the form;

$$\begin{bmatrix} \Delta u \\ \Delta y \\ \pi \end{bmatrix}_t = \begin{bmatrix} H_{11}(L) & H_{12}(L) & H_{13}(L) \\ H_{21}(L) & H_{22}(L) & H_{23}(L) \\ H_{31}(L) & H_{32}(L) & H_{33}(L) \end{bmatrix} \begin{bmatrix} \Delta u \\ \Delta y \\ \pi \end{bmatrix}_t + \begin{bmatrix} \psi_u \\ \psi_y \\ \psi_\pi \end{bmatrix}_t + \begin{bmatrix} \mu_u \\ \mu_y \\ \mu_\pi \end{bmatrix}_t \tag{13}$$

It can be shown than the VAR residuals can be written as;

$$\begin{bmatrix} \mu_u \\ \mu_y \\ \mu_\pi \end{bmatrix}_t = \begin{bmatrix} \psi_u \\ \psi_y \\ \psi_\pi \end{bmatrix}_t + \begin{bmatrix} A_{11}(0) & A_{12}(0) & A_{13}(0) \\ A_{21}(0) & A_{22}(0) & A_{23}(0) \\ A_{31}(0) & A_{32}(0) & A_{33}(0) \end{bmatrix} \begin{bmatrix} \varepsilon1 \\ \varepsilon2 \\ \varepsilon3 \end{bmatrix} \tag{14}$$

Where, once identified $A(0)$ describes contemporaneous effects of structural innovations, while $[\varepsilon1 \quad \varepsilon2 \quad \varepsilon3]'$ is defined as; $\varepsilon1$ is permanent shock (Aggregate Supply shock), $\varepsilon2$ Real Demand shock (Aggregate Demand shock), $\varepsilon3$ is nominal demand shock. Here I impose long run restriction off the form $H_{11}(L) = H_{22}(L) = H_{33}(L) = H_{21}(L) = H_{31}(L) = H_{32}(L) = 0$, i.e., I impose a lower triangular matrix long run restriction.
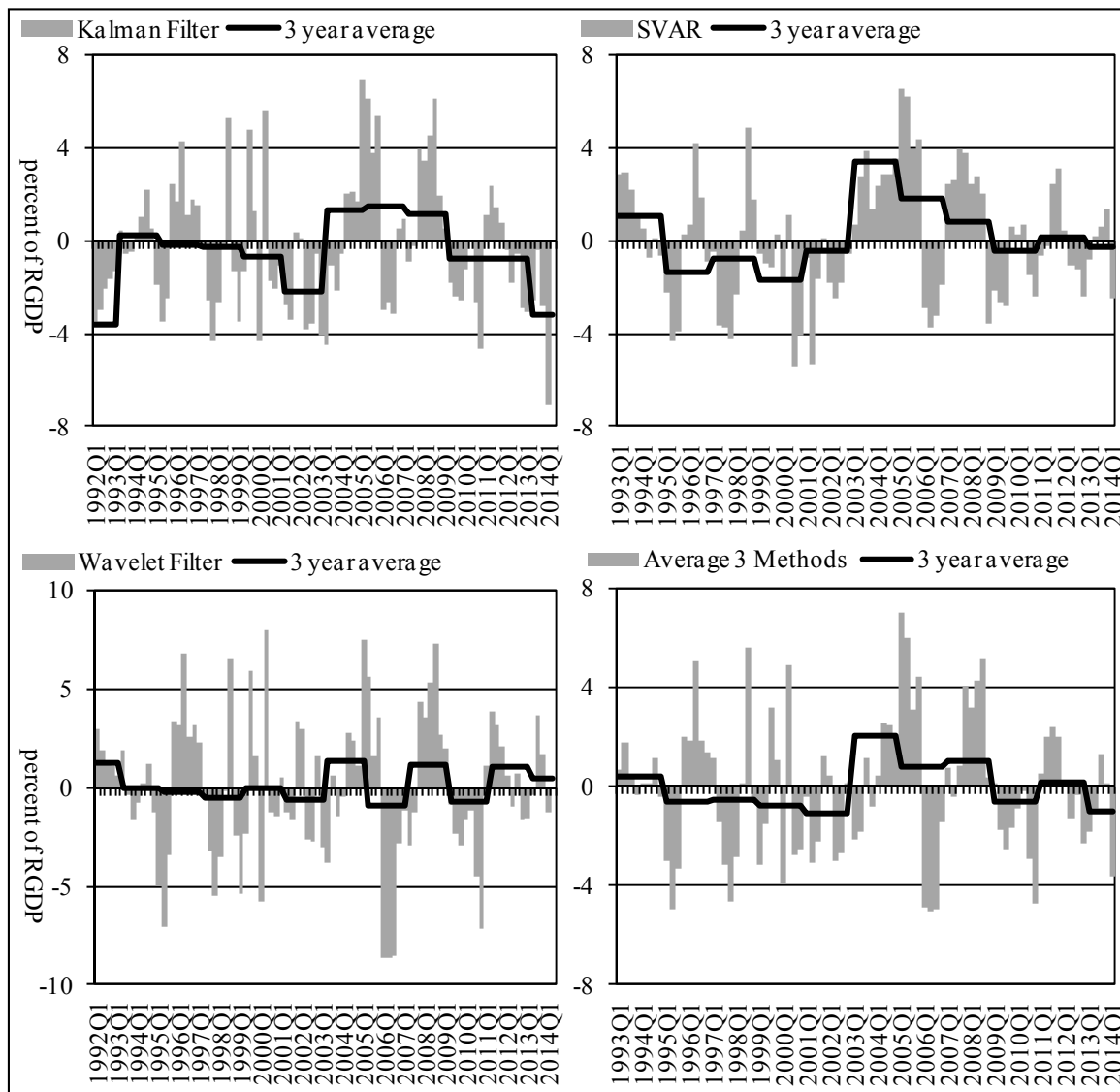
Figure 2. Estimates of output gap of Pakistan on quarterly frequency using 3 methods

Thus a $A_{ii}(L)$ can computed as Cholesky decomposition of the Covariance matrix of the variables, which in turn can be used to identify $A(0)$, this yield a theory consistent interpretation of shocks as being divided into a transitory component and another permanent component. Estimated output gap using the above methodology can be seen in Figure 2 below.

3.3 Wavelet Filter Method

Wavelet filtering is an excellent tool for analyzing properties of time series. In essence of Percival and Walden (2000) a typical Wavelet filter can be programmed to extract the long and short run trends in the time series as;

$$y(t) = y_{trend}(t) + \sum_{j=0}^{2} y_j(t) \tag{15}$$

Where $y(t)$ denotes real output, $y_{trend}(t)$ denotes trend component defined as cycles with periodicity greater than 16 quarters, and $y_j(t)$ denotes cyclical components with periodicity as; $y_0(t)$ depicts high frequency noise (i.e., cyclical periodicity between 0-4 quarters), $y_1(t)$ show cyclical periodicity between 4–8 quarters and lastly, $y_2(t)$ illustrate cyclical periodicity between 8–16 quarters.

Cyclical components extracted with wavelet filter of the above representation closely represents the cyclical component extracted using an approximate Band pass filter see Baxter and King (1999). Wavelet filter has the advantage over approximate Band pass filter by extracting cyclical component over the entire range of the sample. I implement the wavelet filter consistent with the methodology and implementation in Motohiro (2008) (Note 1), the J-level wavelet decomposition of a continuous time series can be depicted as;

$$y(t) = \sum_k \tilde{a}_{0k} \psi_{0k}(t) + \sum_{j=0}^{J-1} \sum_k \tilde{b}_{jk} w_{jk}(t) \tag{16}$$

Where;

$$\tilde{a}_{0k} = \int y(t) \tilde{\psi}_{0k}(t) dt \tag{17}$$

$$\tilde{\psi}(t) = \sum_{k=0}^{\tilde{N}} 2h_0(k) \tilde{\psi}(2t - k) \text{ (Analysis dilation equation)} \tag{18}$$

$$\tilde{b}_{jk} = \int y(t) \tilde{w}_{jk}(t) dt \tag{19}$$

$$\tilde{w}(t) = \sum_{k=0}^{\tilde{N}} 2h_1(k) \tilde{\psi}(2t - k) \text{ (Analysis Wavelet equation)} \tag{20}$$

$$\psi(t) = \sum_{k=0}^{N} 2f_0(k) \tilde{\psi}(2t - k) \text{ (Synthesis dilation equation)} \tag{21}$$

$$w(t) = \sum_{k=0}^{N} 2f_1(k) \tilde{\psi}(2t - k) \text{ (Synthesis wavelet equation)} \tag{22}$$

Where $h_0(k)$ and $h_1(k)$ are low pass and high pass analysis filters and $f_0(k)$ and $f_1(k)$ are low and high pass synthesis functions. Using the above representation I estimate a wavelet filter of scale, $J = 2$, using a biorthognal representation, consistent with Motohiro, Y., (2008), Figure 2 depicts the output gap for the case of Pakistan estimated using the filter representation stated above.

Table 1a. Descriptive statistics of output gap estimates

	Kalman	SVAR	Wavelet
Mean	-0.227	0.049	-0.072
Median	-0.455	0.071	-0.397
Maximum	6.909	6.530	7.963
Minimum	-7.077	-5.392	-8.642
Std. Dev.	2.902	2.686	3.712
Kurtosis	2.792	2.399	2.883
Correlation Coefficient between Estimates of Output Gap			
	Kalman	*SVAR*	*Wavelet*
Kalman	1	0.621	0.844
SVAR		1	0.589
Wavelet			1

Table 1b. Diagnostics of quarterly output gap estimates

Range	Output Gap Kalman	Wavelet	SVAR
1993Q1–1994Q4	+ve	break even	+ve
1995Q1–1996Q4	-ve	-ve	-ve
1997Q1–1998Q4	-ve	-ve	-ve
1999Q1–2000Q4	-ve	break even	-ve
2001Q1–2002Q4	-ve	-ve	-ve
2003Q1–2004Q4	+ve	+ve	+ve
2005Q1–2006Q4	+ve	-ve	+ve
2007Q1–2008Q4	+ve	+ve	+ve
2009Q1–2010Q4	-ve	-ve	-ve

| 2011Q1–2012Q4 | -ve | +ve | +ve |
| 2013Q1–2014Q1 | -ve | +ve | -ve |

4. Conclusion and Policy Implications

One of the most significant aspects of the estimates of output gap from the three different methods is that; although the magnitude of excess capacity (Positive Output Gap) or excess demand (Negative Output Gap) varies with the methods, the general direction of the output gap (both positive and negative) is analogous. This is also evident in the descriptive statistics and correlation coefficients between the estimates. Table 1 identifies periods of excess demand and excess supply for the case of Pakistan (see Table 1b).

Latent variables like the output gap and potential output are notoriously difficult to pinpoint and important still relevant literature suggests the contrary in many studies. Cayen and Van Norden (2004), Gaiduch and Hunt (2000) and Orphanides et al. (2002) identify caveats such as vast differences in estimates, misidentification of models, variation in real time estimates and statistical uncertainty as main obstacles for robust estimation of output gap.

Table 2. Diagnostics of models for forecasting output gap in range FY2014Q2–FY2015Q4

Model 1: Based on State–Space Model			
ARIMA Model	Serial LM Test	R^2	Durbin Watson
AR(1,3), I(1), MA(3, 4, 6, 8)	0.000 (1.000)	Good	1.998
Model 2: Based on SVAR Model			
ARIMA Model	Serial LM Test	R^2	Durbin Watson
AR(1, 2, 4), I(1), MA(5, 7, 8)	2.359 (0.307)	Good	2.209
Model3: Based on Wavelet filtering			
ARIMA Model	Serial LM Test	R^2	Durbin Watson
AR(2, 3), I(1), MA(2)	1.146 (0.563)	Good	1.838

Note. Serial LM Test results in brackets are the corresponding probability values.

Corroboration in output gap estimates within the framework of the three methods discussed in this paper is very interesting and insightful for use in policy decisions, this is especially important considering the analysis in this paper is conducted on quarterly frequency, as time series of higher frequency tends to exhibit higher variance.
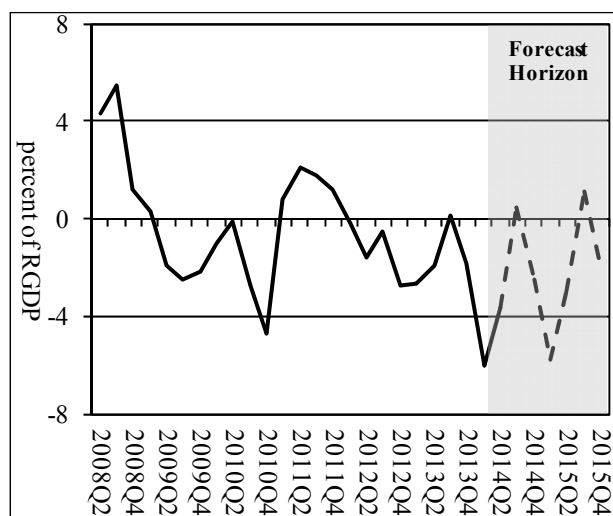
Figure 3. Weighted forecast of output gap using estimates from 3 ARIMA models

Output Gap estimates form important policy blocks in many macroeconomic policies like the Taylor rule. It is therefore understood that direction or trend of Output gap has most significance with respect to forward-looking policy formulation. One important policy query in this regard is that when shall the aggregate demand pick up in

momentum in the short run in the future. As positive output gap signifies the existence of upbeat Aggregate Demand we can address the policy question by forecasting output gap. In this backdrop I estimated an ARIMA model for forecasting output gap in the short run. Table 2 illustrates diagnostics and results from the ARIMA model, these results depict statistically significant results therefore we can move towards forecasting output gap in the range FY2014Q2–FY2015Q4. Figure 3 depict forecast results from the weighted averages of forecasts from the 3 ARIMA models depicted in Table 2. Concluding; It can be safely stated that aggregate demand is expected to rebound (depicted as positive Output gap) after FY2015Q4.

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Note

Note 1. The Matlab codes for implementation of Motohiro Y (2008) can be accessed via this link; (https://sites.google.com/site/motohiroyogo/home/research/#Econometrics)

Appendix A

Temporal Disaggregation for Obtaining Quarterly Estimated of Real GDP of Pakistan Using Annual Data

Table A1. Elaborating step 2

Time Period	Sub Period
1978–1980	*m=1*
1981–1983	*m=2*
1984–1986	*m=3*
1987–1989	*m=4*
1990–1992	*m=5*

1993–1995	*m=6*
1996–1998	*m=7*
1999-2001	*m=8*
2002–2004	*m=9*
2005–2007	*m=10*
2008–2010	*m=11*
2011–2014	*m=12*

It must be understood here that the aim of temporal disaggregation exercise is not the extraction of properties and factors impacting the direction of the real output of Pakistan rather it is intended to implement the usage of LSM index as a proxy of Real GDP of Pakistan in order to observe the trend and cyclical components of the time series.

It is stated for reference that in many studies where the data of higher frequency than Annual data is not available, Large Scale Manufacturing Index is commonly used as a proxy, doing so is acceptable theoretically, as in many economies the LSM has a very decent fit to overall Real GDP.

In Pakistan's case the correlation coefficient between Annual RGDP and Annual LSM is 0.99, which is testament to the viability of using Quarterly LSM series for construction of econometrically significant proxy of Real GDP;

We proceed thus;

Step 1: For the Annual series of RGDP and LSM in the range FY1978–FY2013 we calculate;

$$\frac{RGDP_t}{IPI_t} \text{ for } t = FY1978, \dots, FY2013$$

Step2: We divide the time period in the range FY1978–FY2013 in to equal sub-periods of 3 years;

For every *m = 1, …, 12* we estimate;

$$\frac{\sum_{t=1}^{3}\left(\frac{RGDP_{mt}}{IPI_{mt}}\right)}{3} = (Multiplication\ Factor)_n$$

Where *n = m = 12*, moving on;

So that when *m = 1*

$$\frac{\sum_{t=1}^{3}\left(\frac{RGDP_{mt}}{IPI_{mt}}\right)}{3} = \frac{\left(\frac{RGDP_{1,\ 1978}}{IPI_{1,\ 1978}}\right)+\left(\frac{RGDP_{1,1979}}{IPI_{1,1979}}\right)+\left(\frac{RGDP_{1,1980}}{IPI_{1,1980}}\right)}{3} = \frac{\left(\frac{1789.96}{14.88}+\frac{1888.91}{15.32}+\frac{2027.31}{17.02}\right)}{3} = 120.91 = (Multiplication\ Factor)_1$$

Table A2. Elaborating step 3

Time Period	Multiplication Factor
1978 Q1–1980 Q4	*n=1*
1981 Q1–1983 Q4	*n=2*
1984 Q1–1986 Q4	*n=3*
1987 Q1–1989 Q4	*n=4*
1990 Q1–1992 Q4	*n=5*
1993 Q1–1995 Q4	*n=6*
1996 Q1–1998 Q4	*n=7*
1999 Q1–2001 Q4	*n=8*
2002 Q1–2004 Q4	*n=9*
2005 Q1–2007 Q4	*n=10*
2008 Q1–2010 Q4	*n=11*
2011 Q1–2014 Q4	*n=12*

After calculating the (*Multiplication Factor*) for *n = m = 12*, we proceed as;

Step 3: To arrive at an estimate of Real GDP on Quarterly basis for every quarter between FY1978Q1–FY2014Q1, we estimate;

$$RGDP_{Q_i} = \{(Multiplication\ Factor)_n\}\ x\ IPI_{Q_i}$$

Where *(Multiplication Factor)$_n$* shall evolve in the above equation as under (see Table A2). Whereby we shall now get RGDP for each quarter between FY1978Q1–FY2014Q1.

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The Circle of Investment: Connecting the Dots of the Portfolio Management Cycle … under the Purview of the Uncertainty Principle of the Social Sciences

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Abstract

We will look at the entire cycle of the investment process relating to all aspects of, formulating an investment hypothesis; constructing a portfolio based on that; executing the trades to implement it; on-going risk management; periodically measuring the performance of the portfolio; and rebalancing the portfolio either due to an increase in the risk parameters or due to a deviation from the intended asset allocation.

We touch upon the fundamentals of multi-factor models and how they are used across the different stages of the investment cycle. We also provide several illustrative analogies that are meant to intuitively explain the pleasures and the pitfalls that can arise while managing a portfolio.

If we consider the entire investment management procedure as being akin to connecting the dots of a circle, then the Circle of Investment can be represented as a dotted circle with many dots falling approximately on the circumference and with no clue about the exact location of the centre or the length of the radius.

We represent the investment process as a dotted circle since there is a lot of ambiguity in the various steps involved. The circle also indicates the repetitive nature of many steps that are continuously carried out while investing.

While there are numerous methods that can be applied to each step of the process, we mention the ones that are most used in practice and highlight the elements that a practitioner needs to watch out for. In the beginning, we consider the idea of market efficiency and equilibrium and the lack of both, though we find that there is a tendency to move towards efficiency and the establishment of states of pseudo-equilibrium. This leads to the realization that any hypothesis comes with limitations and that investments are constantly under the shadow of this uncertainty.

This work introduces two new points pertaining to this dotted circle and improves the ability; to understand how far-off this dotted circle is, from a more well-defined circle and; to create a well-formed circle. One point lies close to the centre of the circle and helps clarify both the size and shape of the circle. The other point lies on the periphery of the circle and helps with forming a more round shape.

The two innovations we introduce regarding the investment life-cycle are:

1). The first, relating to the limitations that apply to any finding in the social sciences, would be the additional point we introduce that lies near the centre of the circle. We title this as, "The Uncertainty Principle of the Social Sciences".

2). The second, relating to establishing confidence levels in a systematic manner for each view we associate with a security or group of securities as required by the Black Litterman framework, would be the new point we present near the circumference of the circle.

We restrict ourselves primarily to the equity asset class, while clarifying earlier on that the main differences between asset classes are simply due to the contractual terms and the number of parties involved in the transfer of wealth. In addition to equities, we look at the execution costs that apply to foreign exchange, fixed income and commodities. This is important since some equity portfolios could be across different markets and hence have currency exposure; or the portfolio could hold high grade fixed income instruments, in lieu of holding cash; or there might be the occasional active bet on commodities to increase the return or as a diversification measure.

Keywords: circle, investment, risk, portfolio management, uncertainty, principle, social science, alpha, beta, Black-Litterman

1. Uncertainty Principle of the Social Sciences

At the outset, let us look at some fundamentals that govern all financial instruments and then delve into the nuances for the Equity asset class. It is also worthwhile to mention here that for most assertions made below, numerous counter examples and alternate hypothesis can be produced. These are strictly attempts at tracing the essentials rather than getting bogged down with a specific instance. However, investing requires forming a conceptual framework based on the more common observations, yet being highly attuned to any specifics that can stray from the usual. Also, for the sake of brevity, a number of finer points have been omitted and certain simplifying assumptions have been made.

The various financial instruments that exist today can be broadly viewed upon as vehicles for providing credit and a storage for wealth, for both individuals and institutions alike. The different instruments, both in terms of their nomenclature and their properties, then merely become manifestations of which and how many parties are involved in a transaction and the contractual circumstances or the legal clauses that govern the transaction.

Despite the several advances in the social sciences and in particular economic and financial theory, *we have yet to discover an objective measuring stick of value, a so called, True Value Theory*. While some would compare the search for such a theory, to the medieval alchemists' obsession with turning everything into gold, for our present purposes, the lack of such an objective measure means that the difference in value as assessed by different participants can effect a transfer of wealth. This forms the core principle that governs all commerce that is not for immediate consumption in general, and also applies specifically to all investment related traffic which forms a great portion of the financial services industry.

Although, some of this is true for consumption assets; because *the consumption ability of individuals and organizations is limited and their investment ability is not*, the lack of an objective measure of value affects investment assets in a greater way and hence investment assets and related transactions form a much greater proportion of the financial services industry. Consumption assets do not get bought and sold, to an inordinate extent, due to fluctuating prices, whereas investment assets will. The price effect on consumptions assets affects the quantity bought and consumed, whilst with investment assets, the cyclical linkage between vacillating prices and increasing number of transactions becomes more apparent.

Another distinguishing feature of investment assets is the existence or the open visibility of bid and ask prices. Any market maker for investment assets quotes two prices, one at which he is willing to buy and one at which he is willing to sell. Consumption assets either lack such an outright two sided quote; or it is hard to painlessly infer viewable buy and sell prices, since it involves some conversion from a more basic form of the product into the final commodity being presented to consumers. Examples for consumption assets are a mug of hot coffee, that requires a certain amount of processing from other rudimentary materials before it can be consumed; or a pack of raw almonds which is almost fit for eating. Coffee shops that sell coffee do not quote a price at which they buy ready drinkable coffee; the price at which a merchant will buy almonds is not readily transparent. Gold is an example of both, a consumption and an investment asset. A jewellery store will sell gold and objects made of gold; but it will also buy gold reflecting its combined consumption and investment trait. This leaves us with financial securities like stocks and bonds that are purely investment assets.

A number of disparate ingredients contribute to this price effect; like how soon the product expires and the frequent use of technology to facilitate a marketplace. EBay is an example of a business where certain consumption goods are being bought and sold. This can happen even if goods are only being sold, through the increased application of technology in the sales process. While not implying that the use of technology is bad, technology, or almost anything else, can be put to use that is bad. Thankfully, we are not at a stage where Starbucks will buy and sell coffee, since it can possibly lead to certain times of the day when it can be cheaper to have a cup of coffee and as people become wary of this, there can be changes to their buying habits, with the outcome that the time for getting a bargain can be constantly changing; making the joys of sipping coffee, a serious decision making affair. Even though this is an extreme example, we will overlook some of these diverse influences for now, since our attempt is to exemplify the principal differences between the varieties of financial transactions and the underlying types of assets that drive these deals.

This lack of an objective measure of value, (henceforth, value will be synonymously referred to as the price of an instrument), makes prices react at varying degrees and at varying speeds to the pull of different macro and micro factors. The greater the level of prevalence of a particular instrument (or even a particular facet of an instrument) the more easily it is affected by macro factors. This also means that policies are enforced by centralized

institutions, (either directly by the government or by institutions acting under the directive of a single government or a coalition of governments), to regulate the impact of various factors on such popular instruments. Examples for this would be interest rate dependent instruments, which are extremely sensitive to rates set by central banks since even governments issue such instruments; dividends paid by equity instruments which are clearly more sensitive to the explicit taxation laws that govern dividends than to the level of interest rates; and commodities like oil, which are absolutely critical for the smooth functioning of any modern society and hence governments intervene directly to build up supplies and attempt to control the price.

Lastly, it is important that we lay down some basics regarding the efficiency of markets and the equilibrium of prices. Surely, a lot of social science principles and methodologies are inspired from similar counterparts in the natural sciences. A central aspect of our lives is uncertainty and our struggle to overcome it. Over the years, it seems that we have found ways to understand the uncertainty in the natural world by postulating numerous physical laws.

These physical laws are deductive and are based on three statements—a specific set of initial conditions, a specific set of final conditions and universally valid generalizations. Combining a set of generalizations with known initial conditions yields predictions; combining them with known final conditions yields explanations; and matching known initial with known final conditions serves as a test of the generalizations involved. The majority of the predictions in the physical world hold under a fairly robust set of circumstances and cannot be influenced by the person making the observation and they remain unaffected if more people become aware of such a possibility.

In the social sciences, the situation is exactly the contrary. A set of initial conditions yielding a prediction based on some generalization, ceases to hold, as soon as many participants become aware of this situation and act to take advantage of this situation. This means that predictions in the social sciences are valid only for a limited amount of time and we cannot be sure about the length of this time, since we need to factor in constantly the actions of everyone that can potentially influence a prediction, making it an extremely hard task.

All attempts at prediction, including both the physical and the social sciences, are like driving cars with the front windows blackened out and using the rear view mirrors, that give an indication of what type of path has been encountered and using this information to forecast, what might be the most likely type of terrain that lies ahead for us to traverse. The path that has been travelled then becomes historical data that has been collected through observation and we make estimates on the future topography based on this. Best results generally occur, when we combine the data we get in the rear view mirror with the data we get from the side windows, which is the gauge of the landscape we are in now, to get a better comprehension of what lies ahead for us. The quality of the data we gather and what the past and the present hold then give an indication to what the future might be. So if the path we have treaded is rocky, then the chances of it being a bumpy ride ahead are higher. If it has been smooth, then it will be mostly smooth. Surely, the better our predictions, the faster we can move; but then again, it is easy to see that the faster we travel, the more risk we are exposed to, in terms of accidents happening, if the constitution of the unseen scenery in front of us shifts drastically and without much warning.

A paramount peculiarity of the social sciences is that passage on this avenue is part journey and part race. The roads are muddy, rocky and more prone to have potholes. This means being early or ahead on the road brings more winnings. We also have no easy way of knowing how many people are traveling on this path, either with us, ahead of us or even after us. As more people travel on the path, it starts falling apart, making it harder to travel on it, a situation which is accentuated considering we don't have any vision out front. On the other hand, let us say, physical science roads, being well paved and well-constructed using concrete, hold steady for much longer time durations, so what has been observed in the past can be used to make durable forecasts that hold for lengthier amounts of time in the future.

This inability to make consistent predictions in the social sciences and the lack of an objective measure of value or a True Price Theory means that is almost impossible for someone to know what a real state of equilibrium is. The efficient market hypothesis in spite of being a very intriguing proposition, can at best claim that markets have a tendency to move towards being efficient, though a state of equilibrium is never fully attained since no one has an idea what that state of equilibrium is and the actions of the participants serves only to displace any state of equilibrium, if it did exist. The analogy for this would be a pendulum with perpetual motion; it swings back and forth around its place of rest with decreasing amplitude and the place of rest keeps changing with time, starting a new cycle of movement with reinforced vigour.

We can then summarize the above with the Uncertainty Principle of the Social Sciences, which can be stated as, "Any generalization in the social sciences cannot be both popular and continue to yield predictions or in other

words, the more popular a particular generalization, the less accurate will be the predictions it yields". This is because as soon as any generalization and its set of conditions become common knowledge, the entry of many participants shifts the equilibrium or the dynamics, such that the generalisation no longer applies to the known set of conditions.

All our efforts as professionals in the field of investment, will then be to study uncertainty and uncover quasi-generalizations; understand its limitations in terms of what can be the closest states of pseudo-equilibrium; how long can such a situation exist; what factors can tip the balance to another state of temporary equilibrium; how many other participants are aware of this; what is their behaviour and how is that changing; etc., making our professions a very interesting, challenging and satisfying career proposition.

With this in mind, we can turn specifically to how the above discussion applies to the Equity Asset class.

2. Important Elements of the Equity Asset Class

The Equity asset class holds the potential for unlimited upside and brings with it partial ownership of the firm and hence some influence over the decision making process. It can be argued that *this premise of boundless profits, coupled with limited losses or liability and a certain degree of control, make this asset class an extremely appealing one*, contributing to its immense popularity.

Most equity instruments are traded on exchanges and the act of listing itself serves as a signal of confidence to potential investors or the public. Trading on exchanges also means the counterparties are anonymous as opposed to fixed income and FX markets where a lot of deals are done on the phone.

The debt of two similar companies will be more identical to each other than the equity of the same two companies (This is purely in terms of how sensitive the instruments are to various stimuli), making the equity asset class the most granular in terms of the number of different types of instruments and markets around the world.

The overall size of the equity asset class is smaller than the fixed income and FX markets.

While, Market Efficiency is non-existent in its strictest sense in almost every asset class, the Equity asset class has the least tendency to be efficient since it lacks any underpinning forces or levers that can serve as constraints for the establishment of equilibrium. Commodities have the limited supply of some physical product acting as a controlling lever; fixed income and FX instruments have interest rates that are artificially set; but the closest thing that equities have to determine prices are its expected dividends which are extremely prone to fluctuations both within the same instrument and certainly across instruments. (It is a much longer and harder discussion as to what the level of interest rates should be. It is generally accepted that supply and demand conditions cause the violent fluctuations seen in commodity prices).

Randomness or noise exists to a greater extent since there are numerous participants and less forces or levers that can be used to control price levels as opposed to other financial instruments like fixed income, commodities and FX.

The various asset classes can be compared to balloons tethered to the ground, with the equity balloon having the weakest connections to the ground and also the weakest controls to guide it, if it is wind-borne.

The lack of a strong controlling factor also makes regime changes much harder to detect. Regime changes are a major shift in the investment landscape, or from our earlier analogy, this would be a change in the resting place of the pendulum.

The behaviour of equity prices are modelled as Brownian motions with a certain amount of drift, which is usually the rate of return of the instrument. Historically, this model seems to work fairly well since equity prices have been known to increase over time with a certain amount of noise or variation around that long term growth rate.

Equity prices are considered to be Markovian, that is historical prices have no ability to predict future prices. While other asset classes are also Markovian to a great extent, equity prices are more Markovian than the rest since they are subject to a greater amount of randomness and lack strong controlling factors.

Generally, falling equity prices are a leading indicator of economic contraction and high equity prices are lagging indicators of an asset price bubble build up.

The equity asset class has seen a large number of bubbles since its inception and it seems to be a periodically recurring phenomenon. This again can be partly attributed to the lack of any major controlling factor over equity prices. It is possible to separate the formation and bursting of bubbles into five different stages.

➢ Displacement: Some change in economic circumstances creates new and profitable opportunities for certain companies.

➢ Euphoria: In this stage, the growth prospects of the companies or the expected profits are vastly overestimated and lead to rapid price growth.

➢ Mania: Many first time investors enter the market seeking to make quick capital gain returns. This is also referred to sometimes as a herding phenomenon, where people do things because others are doing it.

➢ Distress: The early entrants or the more savvy investors see that the expected profits are not justified and cash out with their profits.

➢ Revulsion: The market begins to fall and causes a stampede of investors to pull out their money, resulting in a number of investors facing severe losses.

After the market crash of 1987, the equity markets have started displaying a positive skew towards lower prices. This means that the *probability of a huge downward move in prices is more than the chance of an upward move of similar magnitude*.

Historically, *equities have outperformed most other investments over the long run*. This is attributed to the slightly higher risk associated with Equity investments since in the event of a company going bust, shareholders are the last group that has any claim on the assets of the firm.

The percentage of house hold savings being directed to equities has increased over the last few decades. Though it has dipped after the most recent financial crisis, the equity share is expected to make a resurgence.

Last but not the least; its origins can be traced to the Netherlands.

3. Characteristics of a Good or a Bad Trade

The factors that dictate a good trade or a bad trade depend on the Time Horizon and the Investment Objective. The time horizon can be classified into short term, medium term and long term. The investment objective can be conservative or aggressive. While there are no strict boundaries between these categories, such a classification helps us with the analysis and better identification of trades.

Any trade that fulfils the investment objective and time horizon for which it is made is a good trade. Otherwise, it is a bad trade.

On the face of it, we can view good trades as the profitable ones and bad trades as ones that lose money. But where possible, if we try and distinguish between proximate causes and ultimate reasons, it becomes apparent that *good trades can lose money and bad trades can end up making money*.

As discussed in the introduction, the noise around the expected performance of any security; our ignorance of the true equilibrium; the behaviour of other participants; risk constraints (these will be discussed in the later sections) like liquidity, concentration, unfavourable geo-political events; etc. implies we would have deviations from our intended results. The larger the deviation from the intended results, the worse our trade is.

What the above implies is that, bad trades show the deficiencies in our planning (estimation process) and how we have not been able to take into account factors that can lead our results astray. It is true that due to the extreme complexity of the financial markets, the unexpected ends up happening and we can never take into account everything. *We just need to make sure that the unexpected, even if it does happen, is contained in the harm it can cause*. The good thing about bad trades is the extremely valuable lessons they hold for us.

We then need to consider how a good trade can lose money. When we make a trade, if we know the extent to which we can lose, when this loss can occur and that situation ends up happening, our planning did reveal the possibility and extent of the loss, hence it is a good trade.

The bottom line is that, good trades or bad trades are the result of our ability to come up with possible scenarios and how likely we think they will happen.

The following are some other factors that can contribute to good equity trades.

The trade will not soak too much of the available liquidity, as measured by the average trading volume, unless of course, we wish to take a controlling stake in the firm.

It is held by a number of investors. There is more uncertainty if there are more investors, but it seems to work to our benefit in most cases. If the number of investors is limited, the possibility of all of them doing the opposite of what we want is higher and more likely.

The noise or the randomness is less so that our decisions can be more accurate. This can be measured by volatility or the price fluctuations that we see.

The firm issuing the securities is not too dependent on any particular product, profits from a particular region, is not overburdened with debt, is paying dividends consistently, its price is not too high compared to its earnings and other fundamental research indicators.

If we are able to see some pattern in the share price changes, that is a good trade. This means that this security is exhibiting non-Markovian behaviour. Such behaviour is usually hard to detect, but it comes down to the lens we are using to view the world or the methods we are using to perform historical analysis.

If the security is affected by any asset price bubbles and we are able to detect the formation of such bubbles.

If we are shorting the security and it has a greater tendency for a downward movement, as exhibited by its skew.

4. Main Risk Factors of the Equity Asset Class

From our earlier analogy, the equity asset class balloon has the weakest tethers to the ground and also has the weakest controls that can be used to establish a price. This simply means every small wind current can set it going in different directions and we have no way to get back to course. From an equity markets perspective, this can be a number of influences, some of which are mentioned below,

- Market Risk (Prices, Interest Rates, Foreign Exchange, Changes in Related Instruments, Volatilities etc.)
- Credit Risk (Unable to fulfil loan obligations)
- Business or Operational Risk (Information Security, Key Employees leaving, Infrastructure Issues, Security Threats etc.)
- Reputational Risk (Involvement in a lawsuit, negative press publicity etc.)
- Regulatory Risk (Changes in the legal environment that can be counterproductive)
- Industry Risk (Rapid changes in the industry can make firms obsolete)
- Liquidity (Trading volumes can go down rapidly during times of stress and the bid-ask spreads can widen)
- Earnings Risk (Variation in historical earnings, sales, dividends, uncertainty in projected dividends and future earnings)
- Size Risk (Threat of hostile takeovers or the firm might suddenly lose favour with the small number of Analysts and Investors)
- Financial Leverage (If Debt / Equity ratio is higher, the firm is more risky)
- Fundamental and Technical Risk Factors (Price/Earnings, Price/Book, Price/Sales, Industry Ratios, Historical Growth in Sales & Earnings, Expected Growth, Change in Profit Margins, Asset Turnover, Overhead Ratios, Price Momentum, Price Reversal, Earnings Momentum, etc.)
- Other Macro Factors (Sensitivity to inflation, economic growth, employment, credit spreads etc.)

Non-Linearity. Apart from the above, heavily studied risk indicators, we need to be very cautious to watch out for the non-linear property of financial instruments. This is best demonstrated when attempting to get Ketchup out of a bottle onto your food. Steadily increasing hits on the base of the bottle don't yield steadily increasing amounts out the other end. None will come for a while and then a lot will. This will have great implications when we look at factor models, which are linear, in later sections. The financial markets are highly non-linear. This has been observed as huge drops in the stock market when nothing much has been happening prior to the drop.

The law of averages does not apply. We might have observed lots of prices and other data for long periods of time and come up with probabilities. Such probabilities work in very structured environments like a casino. The financial markets due to their highly complex nature defy all odds and we need to be prepared for uncertain eventualities.

The assumption of normality is invalidated on many counts. Most Pricing and Risk models assume that prices are distributed either normally or log normally. This makes modelling simpler, but we need to be mindful of the many drawbacks this holds and the situations where this assumption can breakdown.

No discussion about risk is complete, without a mention of Black Swans. These are events, that are very hard to anticipate; but their effects are widely noticed and in retrospect, we seem to have known all about them. This

also deals with various biases we have in our knowledge; how we interpret things and concoct explanations for things that happened in the past. Having said that, history is perhaps the best guide we have to prepare for the future. What we need to is, just be aware of the limitations in using history to predict the future.

So far, we have talked about the unknowns that we know about. What about the unknowns that we don't know about. The only thing, we know about these ***unknown unknowns*** are that, there must be a lot of them, hence the need for us to be eternally vigilant.

5. Fundamentals of Multi-Factor Models

We generally use Multi-Factor models for three main purposes

- ➢ Risk Control or Management (Considered in sections 6 and 11 below);
- ➢ Alpha Generation (Considered in sections 7 , 8 and 10 below);
- ➢ Performance Attribution (Considered in section 14 below).

This is required for the portfolio construction process, for which we need to forecast the expected returns; forecast the variances in these returns and later take stock of how we performed relative to these expectations.

Usually, multi factor models have four main components - A security's exposure to the factors, the excess returns, the attributed factor returns and the specific returns.

The core of it is the attribution of asset returns to chosen common factor and specific returns, plus forecasts of the variances and covariances of these common factor and specific returns. Formally, we can denote this as

$$R_{it} = a_i + b_{i1}F_{1t} + b_{i2}F_{2t} + \ldots + \varepsilon_{it}$$

R_{it} is the return on the asset i in period t;

a_i is the intercept for asset i;

F_{kt} is the factor k during time t;

b_{ik} is the sensitivity of asset i's return to factor k;

ε_{it} is the security specific (idiosyncratic) portion of the return on asset i.

One of the more commonly used techniques is to perform multi-variate regressions either across the time series or cross-sectional across security returns to arrive at the exposure of the different stocks to various factors. This is known as arriving at the factor loadings corresponding to the factors that best explain the security returns.

Generally we use macro-economic factors (like inflation, GDP growth, change in industrial production, spread over government bonds etc.) or fundamental factors (like firm size, dividend yield, book-to-market ratio, industry classification etc.) to understand the returns and variance structure across a universe of securities.

To cover the non-conventional risk factors mentioned in the V section, we could build models tailored to capture that particular risk aspect. For example, to capture industry risk, we can look historically across firms in an industry, their growth rate, their rates of emergence and disappearance etc. and use the results from such a model to rank different industries or give a score for the rate of change within an industry. Such a ranking can then be used an inputs to more conventional factor models.

We can also use other techniques like Principal component/Maximum likelihood analysis across security returns to determine the main factors.

6. Risk Management

The analogy of ***building a plane and flying it*** to constructing a Model and Trading with it, will help us consider the associated risks in a better way. ***Modelling would be the phase when we are building a plane, and the outcome of this process is the plane or the model which we have built; trading would then be the act of flying the plane in the turbulent skies, which are the financial markets***. The modellers would then be the scientists (also engineers) and the pilots would be traders. It is somewhat out of the scope of this document to discuss questions regarding what kind of person can be good at both modelling and trading.

6.1 From an Equity Modelling Perspective

The multi factor model will decompose overall portfolio risk and help identify the important sources of risk in the portfolio and links those sources with aspirations for active return.

We need to use ***the right principles, the right material and the right processes***.

The right principles would mean understanding certain concepts that determine the relevant measure of risk for

any asset and the relationship between expected return and risk when markets are tending towards equilibrium. Examples for these are the **Capital Asset Pricing Model, the Arbitrage Pricing Theory** or other multi index models.

The right material translates to having data on the security returns and choosing the relevant factors. The amount of data and factors that is available is humongous. We need to use some judgement regarding how much history to use. We also need to be attuned to Significance and Causality among the factors. All this can involve some independent data analysis.

The right process would mean using judicious concepts from econometric / statistical theory. Some examples would be to check for the stationarity of variables, to normalize the variables to scale them properly, to see if there is any correlation between the independent variables and correcting for it (Multi-Collinearity). We need to make sure no variables that would have an impact are left out (Omitted Variable Bias)

There needs to be **a lot of tinkering**; this means we need to have a continuous cycle of coming up with a prototype, testing how it works and making improvements based on the performance. This is especially important in the financial markets, since we are chasing moving targets, as implied by our earlier discussion on quasi-equilibriums.

Modelling needs to be well thought out, with due regard to anticipating as many scenarios as possible and building in the relevant corrective or abortive mechanisms when adverse situations occur.

Given that, we are never close to accomplishing a perfect model, which can handle all cases without failure and without constant changes, we would need to constantly supervise the outcomes; hence models that are simple and robust are better suited, since it is easier to isolate the points of failure when things get rough. Robust here means producing similar results under a variety of conditions, with some changes to the inputs or the controls.

6.2 From an Equity Trading Perspective

Trading would need a **good understanding of what the model can do and where it will fall short**.

The model will tell us what types of risk we have in our portfolio and what returns we can expect to get from bearing that risk. Changing market conditions means the relationship between risk and return will be changing as well. But we won't know where that relationship can breakdown and what happens when some of the factors cross the boundaries within which we expect them to stay. This would mean watching out for such occurrences and recalibrating the model or making other decisions like reducing exposure to some factor etc.

Hence, we would need to react rapidly to events as they unfold, which means we need to be able to detect events in real time with a good amount of precision. This would be like a pilot reading the many gauges on his dashboard and responding appropriately. We would need good access to market data or use as many data points as we can assemble.

A watchful eye or sensor(s), which is able to detect our performance, a good feedback mechanism that can take corrective actions based on the inputs from the sensors. The amount of data that needs to checked and the speed with which information can change means we are better of having many automatic procedures that help us check the levels of various parameters.

The feedback mechanism here can be someone manually looking at results of the model and changing either the inputs or the parameters of the model. It could also be automatic where an algorithm can detect the changes and take responsive action. **The combination of manual effort and computer programs, man and machine working in tandem, is at present a good way to approach risk management while trading.**

We need to check the Tracking Error of our portfolio with respect to a benchmark, measured as the volatility of the difference in returns between the portfolio and the benchmark. Passive managers want to minimize this error. Active managers want to outperform the benchmark. They need to monitor the risk results to see how they are positioned, what is their tracking error (active risk) and take on risk in areas they believe they can outperform.

We need to be judicious about not intervening too much, since every intervention has an associated penalty or cost, not to mention, the emotional component of human involvement can cause bad results to get worse.

7. Equity Investment Model and Equity Trading Strategy

Using our earlier analogy of building a plane and flying it, we introduce an additional complexity, which will help us understand the investment modelling aspects and the corresponding trading strategy.

Our investment decisions are made over time and so we set the direction of forward movement in time to be equivalent to flying the plane forward. Since we cannot see what will happen in the future; to fly the plane

forward, we should not be able to see what is in front of us. This is equivalent to *a plane with the front windows blackened out*. All we have are rear view mirrors (most planes don't exactly have rear view mirrors, but let us imagine our plane having one) and windows to the side.

As we are cruising along in time, what we have with us is the historical data or the view from behind and real time data which is the view from the side, to aid in navigating our way forward or to the future.

We use the historical data to build our model and then use the data from the present to help us make forecasts for what the future holds. *The modelling would involve using data inputs to come up with outputs that can help us decide which securities to pick*, or to help set the direction of motion. The *trading aspect* would involve using the model outputs and checking if that is the direction in which we want to be heading, that *is actually deciding which securities to pick*, and watching out for cases where the predictions are not that reliable.

As we can see from the analogy, this is the more challenging aspect of portfolio management and the use of multi factor models.

Capital Asset Pricing Model or Arbitrage Pricing Theory (also other models) can help us identify stocks that should be overweighed or underweighted in the portfolio. We can find securities that are cheap or expensive as given by the excess return or the alpha, relative to the model.

If we are able to identify factors that explain a significant portion of security returns, or we have factors in mind that we think will bear a greater portion of the future risk and hence yield higher return, we overweight securities whose return is explained to a greater extent by those factors.

We can also use fundamental research techniques like the Dividend Cash Flow Model to form expectations of future security prices.

If our performance is tied to a benchmark, we will pick securities that contribute to a big portion of the return in the benchmark. If our intention is to outperform the benchmark, we make intentional picks based on our forecasts of expected return that would exceed the benchmark. Based on these selections, we might be exposed to factors that are incidental or they will be the unintentional choices of our active selection. For example, if we pick securities that have high exposure to GDP growth, we may end up getting more exposure to certain sectors or industries and this may not be exactly what we want. This unintended exposure needs to be managed.

Once we have the forecasts of expected returns, we can construct optimal portfolios that implement bets on those returns. We maximize utility, defined as risk adjusted returns depending on our level of risk aversion. The Covariance of the factors from the risk model that we discussed in the previous sections will be used here along with the expected returns. The optimization can include various constraints like liquidity, size of the firm, total exposure to a particular sector, minimum dividend yield etc. The results of this step and the revisions performed here based on market conditions would be the more trading focused aspects of investment.

If two assets are similar, but one has a slightly higher forecasted return, traditional optimization techniques allocate everything to asset with the higher forecasted return and nothing to the other asset. This issue can be resolved by using the *Black Litterman Model*, where we assume a prior equilibrium distribution of the assets and apply our views to tilt the weights based on the strengths we associate with those views.

We also need to be highly sensitive to regime changes, which mean the data from the past will fail to apply to future views. This would mean, we have to go back to the drawing board and come up with new models and factors.

The finer aspects of the distinction between trading and modelling from the earlier sections apply here, almost verbatim.

8. The Model for Security Selection

We can rank the securities in the universe based on single factors (here a factor is a measure for comparing securities, e.g., Price-Earnings Ratio) or combinations of factors (we refer to this combination as a model). The different factors in a model can be equal weighted or the weights can be seeded based on an intuitive understanding of the relationships between the individual factors.

The factor weights can also be obtained as the result of an optimization process, which maximizes the returns or minimizes the variance for different groups of securities, over different historical periods. The returns can be absolute returns or the returns of one group relative to another group. These different groups of securities can be at the top or bottom quartile, or a certain percentile at the top and bottom of the ranking. We can also consider the excess returns of groups of securities versus the benchmark returns, in which case, we just go long the securities in the chosen group. We can also consider the excess returns of one group of securities versus another

group, in which case we are long the first group and short the second group. Mean Variance Optimization can lead to unstable results, but this is a useful starting point.

We can also optimize the factor weights to achieve a certain ranking of securities at a certain point in time, that provides a decent return profile (either relative or absolute) for a certain top percentile of the ranking and ensure that this ranking is stable over successive investment horizons. We refer to the length of these successive investment horizons as the holding period. *The stability of the ranking can be measured by the Information Co-efficient (IC) of the ranking. This is calculated as the rank correlation (measure of the degree of similarity between two rankings) of the security ranking at different points in time. A higher information ratio (mean IC divided by standard deviation of IC) indicates higher stability and higher predictive ability.* The IC is generally measured as the rank correlation between the ranking of the universe based on a factor or model at a certain point in time and the ranking of the universe based on security returns at the end of the holding period. The factors weights can also be obtained through statistical methods like the Principal Component Analysis, but the results are not easily interpretable in this case.

Another useful measure is the *hit-ratio, measured as the number of holding periods over the historical back test interval over which the information co-efficient is positive*. Higher the hit ratio is, higher is the predictive ability of our model. *The hit ratio or the Information Ratio can be used to establish a confidence level for this particular view on the securities we have in this group.* For negative information ratios, we set the confidence level to zero. This will be an input to the Black Litterman model, the usage of which will be discussed in the next section.

So *our selection model boils down to picking securities or groups of securities with high relative returns and high information ratios.* Once we find factors that are showing excess returns in a group of securities, versus another group or the universe itself, we can also run regressions of these factors across the returns of the group showing excess returns to ensure there is statistical significance.

There are numerous ways in which a model can be selected and hence for the implementation, we need to have a trial and error approach and pick the more suited ones at that point in time. Extensive automation to calculate various ranks, IC's, means, regression co-efficients etc. would aid the selection process greatly. We also need to fit the model for a sample and test it across other samples. (In-Sample/Out of Sample methodology)

9. The Weights of Portfolio Positions

We could use any of the numerous Mean Variance Optimization (MVO) methods to arrive at the portfolio weights. There are many drawbacks with an MVO approach; the main ones being the problem of unintuitive, highly concentrated portfolios, with high sensitivity to the inputs where the estimation errors can get magnified. The Black and Litterman model is a good way to get around these issues.

To implement the Black Litterman model, which is Bayesian, we need market equilibrium expected returns as a starting point. These returns and the associated return variance would be our prior distribution. If our universe is a price weighted index like the DJIA, we need to construct a market capitalization weighted proxy for this index with all the components and use these weights to get the equilibrium expected returns as our starting point.

$$\pi = \lambda \Sigma w_{mkt}$$

where, π is the Implied Excess Equilibrium Return Vector (N x 1 column vector); λ is the risk aversion coefficient; Σ is the covariance matrix of excess returns (N x N matrix); and, w_{mkt} is the market capitalization weight (N x 1 column vector) of the assets.

We can then use the model for security selection outlined in the previous section and get relative views (or absolute views) on return performance for specific securities or groups of securities. We can also get the confidence level for each view we associate with a security or group of securities, by the hit ratio or the information ratio of the information co-efficient, defined in the section 8.

The variance of the error term associated with each view represents the uncertainty of the view. It can be obtained by the weight matrix that expresses our views and the co-variance matrix of our returns or a better way would be to find the weights that express full confidence in a view and tilt it so that the variance of the error term is proportional to our actual confidence in the view. We then combine our prior distribution with our views and the variance of the error term associated with each view to get a new posterior distribution. From this, the formula for the new Combined Return Vector (E[R]) is

$$E[R] = [(\tau\Sigma)^{-1} + P'\Omega^{-1}P]^{-1}[(\tau\Sigma)^{-1}\Pi + P'\Omega^{-1}Q]$$

where, E[R] is the new (posterior) Combined Return Vector (N x 1 column vector); τ is a scalar, that is

calibrated such that its value affects the variance of the error term associated with the views, but will not affect final results; Σ is the covariance matrix of excess returns (N x N matrix); P is a matrix that identifies the assets involved in the views (K x N matrix or 1 x N row vector in the special case of 1 view); Ω is a diagonal covariance matrix of error terms from the expressed views representing the uncertainty in each view (K x K matrix); Π is the Implied Equilibrium Return Vector (N x 1 column vector); and, Q is the View Vector (K x 1 column vector).

We can then extract the posterior weights, w, that overlays our views onto the equilibrium weights as

$$w = (\lambda\Sigma)^{-1}E[R]$$

10. Analysis of the Portfolio Alpha and Beta

For simplicity, let us assume that the Single Index Model holds. This means that we assume that the co-movement between stocks is due to the single influence of the benchmark index (or the DJIA universe in our case). To introduce other influences that are industry specific, security specific or macro specific, would be a simple extension of this basic idea and would just involve more matrix and algebraic manipulation. With this assumption, we can decompose the return of the stock into the basic return equation as,

$$R_i = \alpha_i + \beta_i R_m + \varepsilon_i$$

where, R_i is the return on the security; R_m is the return on the market (or universe in our case); α_i is the expected value of the component of security i's return that is independent of the market's performance; ε_i is the error associated with α_i; β_i is a constant that measures the expected change in R_i given a change in R_m.

We can estimate α_i and β_i by running a regression of historical stock returns against the returns of the market. Regression analysis also ensures that R_m and ε_i are uncorrelated over the historical time period under consideration. Beta is given by the co-variance of the security return with the market return divided by the variance of the market return. $\beta_i = \sigma_{im}/\sigma_m^2$. Taking expectations of the basic equation, we get,

$$E(R_i) = \alpha_i + \beta_i E(R_m) \text{ or equivalently, } \alpha_i = E(R_i) - \beta_i E(R_m)$$

From this, it is easy to see that to maximize alpha, we need to maximize the expected return on a security or the product of Beta and expected return on the market has to be small. This means that for a given return on the market, the Beta has to be small to maximize alpha or the security's return must have a low co-variance with the market return or a big portion of a security's return is not explained by the return on the market.

When we introduce other factors that can be used to explain the returns on a security, the same principles used above apply. To maximize alpha, we need to ensure that the expected return on the security is maximized and beta of the security return against that factor (regression co-efficient) is minimal.

11. Risk Evaluation in the Resultant Portfolio

Continuing with the single index model, we can derive the equations for the return variance of a security (1); return co-variance of a security with another security (2); and the variance of a portfolio (3) as below.

$$\sigma_i^2 = \beta_i^2 \, \sigma_m^2 + \sigma_{ei}^2 \tag{1}$$

$$\sigma_{ij} = \beta_i \, \beta_j \, \sigma_m^2 \tag{2}$$

$$\sigma_p^2 = \beta_p^2 \, \sigma_m^2 + \Sigma w_i^2 \sigma_{ei}^2 \tag{3}$$

where, σ_i^2 is the variance of security i, σ_{ij} is the co-variance of security i and security j, σ_p^2 is the variance of the portfolio, σ_{ei}^2 is the variance of the error term. w_i is the weight of security i in the portfolio.

To minimize the risk, we can see that the portfolio beta (which is the weighted sum of the betas of the individual securities in the portfolio) has to be minimized and the weights have to be minimized. So we can pick securities with smaller betas relative to the universe and pick at least a few of them so that the individual weights are less.

12. Portfolio Rebalancing Criteria

Our main criteria for rebalancing would be to ensure that the portfolio tracking error is minimized. Tracking error is defined as the standard deviation of the active returns (difference between portfolio and the benchmark returns). As tracking error increases, we are moving away from our intended allocation weights.

For simplicity, we assume that transaction costs (taxes, market impact, commissions etc.) are linear and rebalancing benefits (related to reducing the risk of the portfolio) are quadratic in nature. As the portfolio drifts away from the intended allocations, the costs increase linearly and the benefits increase in a quadratic manner, which means, at some point, the benefits will outweigh the costs. We can use this point as the trigger point for our rebalancing. Formally, we get the ***Rebalancing Trigger Point*** as $KC_i / (\sigma_i^2 + \sigma_p^2 - 2\sigma_i\sigma_p\rho_{ip})$ *where, K is the*

risk tolerance, which needs to be calibrated separately based on the investment goals of the portfolio. C_i is the transaction costs for asset i; ρ_{ip} is the correlation of asset i and the portfolio.

From this, it follows that, we need to rebalance whenever the Trigger point is less than one, assuming our risk tolerance, K, captures the extent of imbalance that is acceptable between transaction costs and risk in the portfolio.

A more complex strategy would involve a ***dynamic programming approach***, which minimizes the expected cost based on an optimization involving a certain cost function for the transaction costs and a utility based cost function for the tracking error that results from holding a sub-optimal portfolio.

At time t, w_t is our state or the weights in our portfolio; u_t is our policy for this state, that is how we increase or decrease the weights; and n_t is the state uncertainty, which is generated from the return process of the securities. The state transition can be defined by the simple multiplicative function (1), though it can be any arbitrary function.

$$w_{t+1} = (1 + n_t)(w_t + u_t) \qquad (4)$$

where, w_{t+1} represents the new state which is influenced by the prior state wt, the action taken u_t, and the uncertainty in the system dynamics n_t.

We write the cost functional recursively as:

$J_t(w_t) = E[G(w_t, u_t, n_t) + J_{t+1}(w_{t+1})]$ *where, G is the cost for the current period and J_t is the expected future cost from t onwards given all future decisions. So, the cost at any given period is the expected cost from t to t+1 along with the expected cost from t+1 onwards.*

At each time t, the optimal strategy is to choose u_t such that the cost is minimized:

$$J^*_t (w_t) = min_{ut} E[G(w_t, u_t, n_t) + J_{t+1}(w_{t+1})] \qquad (5)$$

The challenge is therefore to determine the values $J^*(w)$. This is done by simulating the price process across the desired time interval and calculating the different values of **$J_t(w_t)$** till we reach convergence, that is, till we reach the fixed point such that **$J^*_t (w_t) = J^*_{t+1} (w_t) = J^*(w)$**. The optimal rebalancing decision is to choose the policy **u^*_t** that minimizes (2).

We specify the cost function as,

$E[G(w_t, u_t, n_t)] = \tau(u_t) + \varepsilon(w_t + u_t)$ *where, $\tau(u_t)$ can be a linear transaction cost depending on the adjustment, u_t, made to the weights; $\varepsilon(\cdot)$ represents the sub optimality cost due to the tracking error. $\varepsilon(w_t + u_t) = 0$ whenever $w_t + u_t = w^*$(i.e. we choose u_t so that we rebalance to the target portfolio); otherwise, $\varepsilon(\cdot) > 0$.*

For any given portfolio weights, w, the expected utility from holding those positions, can be expressed as a risk-adjusted rate of return, given the risk preferences embedded in an appropriate utility function (quadratic, log, power etc.). We can then write the cost of the tracking error as the difference between the risk-adjusted rates of return associated with holding optimal or suboptimal weights. As the number of assets increases, estimation of the returns, variances and co-variances of all the assets becomes more involved. Also, the number of simulations to achieve convergence increases significantly, requiring massive use of computing power.

Other simple strategies for rebalancing include periodic rebalancing, rebalancing when the tracking error crosses a certain threshold, when the allocation weights cross a certain band around the target weights, when risk increases beyond a threshold and combinations of these strategies.

13. Trade Execution and Market Impact

13.1 Equity Asset Class

Here, we look at ***Transaction Cost Analysis (TCA)***, which is most developed for equities. Drawing an analogy between "Portfolio Management" and a student studying for "An Examination", we can consider it as a three pronged process. The planning or the "Pre Trade" phase is when the student is preparing for the examination; the "Execution of Trades" constitutes the real test of one's mettle and is equivalent to the student taking the examination; and the "Post Trade" measurement of performance versus different price benchmarks becomes the Scorecard.

Given that our current focus is Execution centric, formulation of an investment hypothesis is viewed as a separate process that precedes the actual details on how to implement a particular investment objective or an execution schedule. Going back to our Examination analogy, this is simply a student's decision regarding what to study, why study it and related aspects. Irrespective of how an investment strategy is formulated, the rest of the

discussion applies to it, in its entirety. Clearly, there is a feedback loop from the Scorecard phase, where we gauge our results, to the Planning phase where we apply any lessons we learn, towards further improving our Performance.

13.1.1 Pre Trade Metrics

a) Market Impact

Market Impact falls under the category of transaction costs incurred to exceed a certain performance benchmark by forming reasonable return expectations and controlling the risk that comes with the pursuit of the opportunities that can yield the performance targets. Broadly speaking, Market Impact is the indirect cost that occurs because of the transaction itself and is fairly independent of the commissions, taxes, exchange fees and other external costs, though it is affected by many external factors.

At the outset, it might seem that it would be fairly straight forward to develop a market impact cost model by observing the costs associated with previous trades. We could categorize trades into different buckets such as trade size, asset market capitalization, market etc. Then the mean of past costs for a given bucket would be a reasonable indicator of future costs. Upon closer observation, a few reasons make it clear that this method would not work.

- o Market Impact cannot be directly observed, it must be estimated. To reduce estimation error, large statistical samples are required, which implies gathering data over extended time periods. But the underlying process that creates market impact is a highly dynamic one and hence long term averages have very little forecasting ability.

- o The level of information is uneven. The most highly traded assets have very little market impact and the lightly traded assets have much higher impact. But we need to understand the higher costs and be able to predict them better since it is the assets with higher costs that are instrumental in determining the overall portfolio costs and the portfolio construction strategy.

- o Investors avoid costly trades under most possible circumstances. Hence, the data we observe is censored and does not contain many such trades. So any model that is calibrated to observed data will not perform that well under circumstances that seem to warrant higher costs.

The Market Impact model relies on a framework relating the movement in stock prices and other auxiliary variables like Order Size, Trade Time, and Volatility etc. to Impact Costs.

The Price Impact is decomposed into two components, the Permanent Impact and the Temporary Impact.

The permanent component is determined by the fundamental economic forces acting in the market. This reflects the movement in price, due to the buy and sell demands on the security and hence this is independent of any timing related decisions made to buy and sell the securities.

The temporary component occurs over the short term time horizon and is the price concession that is required to attract counterparties. Since it is a key determining factor in whether a transaction can occur successfully, it is highly sensitive to how the trades are scheduled for execution.

Based on the parameters we can observe in the market, we define the following price points that are required to determine the impact of any order.

S_0–Market price before order begins executing;

S_{Post}–Market price after this order is completed;

S_{Avg}–Average Realized price on this order;

Permanent Impact, $I = (S_{Post} - S_0)/ S_0$;

Realized Impact, $J = (S_{Avg} - S_0)/ S_0$;

The Post Trade price, S_{Post} should capture the permanent effects of the program. That is, it should be taken long enough after the last execution that any effects of temporary liquidity effects have dissipated. The temporary impact is defined as the realized impact minus a suitable fraction of the permanent impact.

Asset Prices are assumed to follow an Arithmetic Brownian Motion with the drift term depending on the trade rate, v.

$$dS = S_0\, g(v)\, dt + S_0\, \sigma\, dB$$
$$S_{Avg} = S(t) + S_0\, h(v)$$

g(v) is the permanent impact function;

h(v) is the temporary impact function;

S(t) is the price of the asset at time t;

σ is the volatility of the stock;

B(t) is a standard Brownian Motion;

Trade Rate, v = X/T;

X is the number of shares; it is positive for buy and negative for sell orders;

V is the average daily volume;

T is the total time of trading.

Proceeding further with the above framework, we can assume different functional forms and include variables for bid-ask spread, shares outstanding, market capitalization, country, sector, corporate action indicators, etc. could be included in addition to the factors already considered. We can then use different data sets that contain order and execution information to calibrate the model. The unknown Greek alphabets below are then determined using advanced numerical techniques on the data set chosen for the analysis.

$$I = \sigma\,\gamma\,T\,sgn(X)\,|X/VT|^{\alpha}\,(\theta/V)^{\delta}$$

J-I/2 = σ η sgn(X) |X/VT|$^{\beta}$, sgn is the sign function.

b) **Market Risk.** The Risk inherent in any trading program determines how quickly one would like to take any trading program towards completion. The market risk is calculated as the volatility of the portfolio over the expected time or the desired time to completion. Higher the risk, the more likely is the price to drift away from the desired price used in the portfolio construction procedure and hence the desired time of completion needs to be lower. But if the time to completion decreases, we soak up a higher percentage of liquidity from the market, potentially increasing our Market Impact Costs. Hence achieving optimality in any trading program is a trade-off between the Market Risk and the Market Impact. The time to completion is the variable that will be controlled to achieve a desired end result.

c) **Tracking Error**. This will be the standard deviation of the return difference between the portfolio and the benchmark over a certain historical period.

d) **Bid Ask Spread.** This will be based on the average spread for the individual stocks for the entire trading day averaged over a certain number of trading days. The corresponding figure for the portfolio will be arrived at by using the weights of the individual securities in the portfolio.

e) **Liquidity.** This will be based on the relative size of the order and the trading volume for the entire trading day averaged over certain number of past trading days. The corresponding figure for the portfolio will be arrived at by using the weights of the individual securities in the portfolio.

f) **Beta**. We calculate beta as covariance of the asset returns versus the market, divided by the market variance. We make an adjustment to compensate for the movement of the security beta towards market beta over time using a technique developed by Blume. He corrected past betas by directly measuring the adjustment to one and assuming that the adjustment in one period is a good estimate of the adjustment in the next. This direct measurement is done by regressing Betas for a later period against the Betas for an earlier period. The corresponding Beta figure for the portfolio will be arrived at by using the weights of the individual securities in the portfolio.

13.1.2 Post Trade Metrics

Most of the Post Trade Metrics tend to be simple comparisons of the average executed price versus different price benchmarks like the Volume Weighted Average Price, Open, Close, Previous Close, Arrival, Volume Weighted Price Over an Interval, etc.

13.2 Fixed Income Asset Class

TCA analysis in fixed income cannot be readily calculated like the equity markets, but due to the non-anonymous nature of the trading, transaction costs could be skewed towards the higher end for smaller clients.

13.3 Foreign Exchange Asset Class

TCA analysis in FX is still in the developing stages, but like the fixed income markets, due to the

non-anonymous nature of the trading, transaction costs could be skewed towards the higher end for smaller clients. There are two methods that are generally used, one compares the execution price to the market price (available from centralized service providers) at the time of execution; the other compares execution price to the average of the high and low price for the day.

14. Portfolio Performance Measurement

There are three basic forms of attribution. We will consider the common elements and look at how they differ for the individual asset classes.

Multi-Factor analysis. This was considered in sections 6, 7, 8, 10 and 11 for the forecasting of risk and expected returns as well. It works in a similar way but seeks to attribute the observed returns on the portfolio across different factors and the asset specific returns.

Style Analysis. It will determine the investment style based on the portfolio rate of return. An example of this is the Sharpe Ratio which measures portfolio return in excess of the risk free rate divided by the standard deviation of the portfolio return. Sometimes, we need to look at the excess return achieved for a given level of risk. This would mean locating the return corresponding to the portfolio in question, on the line connecting the market portfolio (this is a hypothetical portfolio that represents all the investable assets held in proportion to their market value) to the risk free rate of return, when risk and return are plotted on a graph. We are using the standard deviation for the two metrics above. We could instead use the beta of the portfolio and we get two alternate measures called the Treynor and Jensen measure. All these categorize the risk and return metrics into different categories for easier comparisons.

Return Decomposition Analysis. We attribute performance versus certain benchmarks. The active management effect is the different between total portfolio return and total benchmark return. This is the sum of three effects, Allocation, Selection and Interaction.

- o *Allocation* refers to the ability of a portfolio manager to allocate across various segments. The allocation effect determines whether the overweighting or underweighting of segments relative to a benchmark contributes positively or negatively to the overall portfolio return. Positive allocation occurs when the portfolio is overweighed in a segment that outperforms the benchmark and underweighted in a segment that underperforms the benchmark. Negative allocation occurs when the portfolio is overweighed in a segment that underperforms the benchmark and underweighted in a segment that outperforms the benchmark.

- o The *selection* effect measures the ability of the manager to select securities within a given segment relative to a benchmark. The over or underperformance of the portfolio is weighted by the benchmark weight, therefore, selection is not affected by the allocation to the segment. The weight of the segment in the portfolio determines the size of the effect.

- o The *interaction* effect measures the combined effect of the selection and allocation decisions within a segment. If a segment is overweighed and the selection was superior, the interaction effect is positive. If the selection was good but the segment was underweighted, the interaction effect is negative.

We need to measure if there are any buy or sell decisions done in anticipation of movements in the markets. This is known as *Timing*. We can test for timing by running a regression of the following form. If in the below regression, the constant c_i is zero then it shows that a straight line can explain the returns of the portfolio, which means there is not much timing ability.

$$R_{it} - R_{Ft} = a_i + b_i(R_{mt} - R_{Ft}) + c_i(R_{mt} - R_{Ft})^2 + e_{it}$$

R_{it} *is the return on the portfolio in period t;*

R_{mt} *is the return on a major index or the benchmark in period t;*

R_{Ft} *is the return on the riskless asset;*

e_{it} *is the residual returns of fund i, in period t;*

a_i, b_i, c_i *are constants.*

We also need to look at the extent of diversification in the portfolio, as measured by how correlated the returns on the portfolio are with respect to a major index.

There are problems with volatility as a measure of risk. Volatility is not a very accurate measure for the investment process since it does not differentiate between upward movements and downward movements in the price. Certain other measures, which capture the difference in price at a certain point and various historical

points, and the amount of time between those points, will capture the upward and downward trajectories of the price in a better way.

To being with, we simply take the return of our portfolio over the holding periods (say one month) over the last year. We then see at how many of these, we have outperformed the benchmark.

We obtain estimates of alpha, beta and the standard deviation of the error term by regressing fund returns on the benchmark returns. Using these, we consider a few risk adjusted measures of performance below, from among the many possibilities. We need to track changing portfolio compositions and changes in portfolio mean and variance due to this; otherwise we will get erroneous results.

Sharpe-Ratio is the average Portfolio excess returns divided by the standard deviation of returns over the sample period. $(R_p - R_f) / \sigma_p$ (R_p is portfolio return; R_f is the risk free rate).

Treynor Measure is the portfolio excess return divided by the systematic risk (Beta) instead of total risk. $(R_p - R_f) / \beta_p$.

Jensen's Alpha is the average return of the portfolio over and above that predicted by the Capital Asset Pricing Model (CAPM). $\alpha_p = R_p - [R_f + \beta_p (R_m - R_f)]$.

Alpha Information Ratio is the alpha divided by the non-systematic risk of the portfolio (standard deviation of the error term). $\alpha_p / \sigma_{\varepsilon p}$.

We calculate the t-statistic for the alpha estimate $(\alpha_p * \sqrt{N}) / \sigma_{\varepsilon p}$ (*N is the number of time periods; $\sigma_{\varepsilon p}$ is standard deviation of the error term*), to see what level of significance we can ascribe to the alpha. The more frequent our sampling frequency, the more accurate will be the t-statistic.

We can see the effect of certain investment styles on performance by regressing portfolio returns on the returns across style portfolios formed based on certain investment styles like Small Cap, Large Cap, High P/E (growth) etc.

The active management effect is the different between total portfolio return and total benchmark return. This is the sum of three effects, Allocation, Selection and Interaction. In the timing point above, cash and equities would be our two asset classes. Though this does not apply to our specific case, it is useful to do this attribution. Allocation refers to the ability of a portfolio manager to allocate across various segments. The selection effect measures the ability of the manager to select securities within a given segment relative to a benchmark. The interaction effect measures the combined effect of the selection and allocation decisions within a segment.

14.1 Equity Asset Class

For Equities, we could attribute the returns to fundamental factors, macro factors, sectors, etc., that is to the various benchmarks. This would give us the excess return or the alpha. These factors and the attribution models are discussed in detail in sections 6, 7, 8, 10, 11 and in the common performance section above.

14.2 Fixed Income Asset Class

Fixed income attribution is not as standardized as the equity evaluation process. We need to also look at different effects when measuring performance. We look at a set of methods that work well for fixed income instruments and follow a three step process.

➢ The first step is the calculation of the return for each security in the portfolio and the benchmark for each day and decomposition of them into various risk components.

➢ Second, the single components are aggregated according to the investment process.

➢ Third, the attribution effects are calculated. We look at three main effects,

o *Carry Effect* is due to the impact of time on the returns of the instrument. This can be further decomposed into systematic and specific carry return. Systematic return comes from the reference yield curve and specific carry return is related to the spread of this security. We also have the coupon effect and the convergence effect, which as the name implies are based on the coupons payments and convergence explains the price changes that arise from the pull to par of a bond.

o *Yield Curve Effect* is due to the yield curve changes. We can categorize the changes into parallel shifts of the yield curve; rotation of the yield curve; change in the shape of the yield curve and shortening of the bond's remaining time to maturity.

o *Spread Effect* is the difference in yield of a security versus the risk free rate for that security (government bonds). The spread changes arise due to the credit rating on the firm, the spread due to

the sector of the instrument, spread due to the specific country.

➢ In addition, we need to look at various auxiliary measures such as,

    ○ Price effect is the difference between the portfolio valuation (done in -house) and the benchmark (valuation by the index provided).

    ○ Trading effect shows the difference between the price at trade time and the in house end of day valuation.

    ○ Allocation effect, as we discussed earlier, shows the result from weighting a certain sector or category with respect to the benchmark.

    ○ Duration effect is due to the modified duration of the security.

    ○ Convexity effect, which is due to the convexity of the yield curve for the security or that particular segment.

➢ Principal component Analysis is a popular tool used for many yield curve related attributions.

14.3 Commodities and FX

The returns on commodities need to be treated slightly differently due to the physical nature of the instruments and since they are primarily held for consumption. There is a cost associated with respect to storing the instrument and we need to factor this in our return attribution mechanism. We consider the case of commodity futures in detail below.

Due to the storage aspects, commodities have something known as a *convenience yield* which reflects the market's expectations concerning the future availability of the commodity. The greater the possibility that shortages will occur, the higher the convenience yield. If users of the commodity have high inventories, there is little chance of shortage and the convenience yield will be low and vice versa. This arises because users of a consumption commodity may feel that the ownership of the physical commodity provides benefits that are not obtained by holders of the futures contracts.

An investor rarely holds a commodity futures contract through to maturity since his intention is not to take delivery of the physical commodity but just to get exposure to changes in its price. In order to avoid taking delivery, the investor will close out or sell the futures contract and initiate a new long position in another futures contract that has a later maturity date.

The returns from passively buying futures contracts and continuously rolling them forward are known as futures only returns. This return is also known as excess returns since this is earned in addition to any returns from the collateral.

The total return is a combination of the *futures only return* and the *collateral return*.

We split the futures only return into the *spot yield* and *roll yield*. The spot yield arises due to changes in prices of nearby contracts (in terms of maturity). The roll yield arises due to rolling a position in a sloping forward curve environment.

The roll yield equals the convenience yield minus the cost of storing the commodity and also financing its purchase.

In addition, we can borrow from the earlier discussion on equity and fixed income to understand the price drivers for commodities.

Currency Performance Attribution. When we are looking at portfolios with multiple currency or foreign currency denominated instruments, we need to isolate the returns into the price appreciation of the assets in the local currency; the returns from converting the local asset values back to the base currency; and the cross product returns, which arise from repatriating local profits back to the base currency or the combination of the local returns and the currency return.

$$R_n = L_n + E_k + L_n E_k$$

    R_n is the return in the base currency of asset n;

    L_n is the local return of asset n, denominated in currency k;

    E_k is the performance of currency k relative to the base currency.

It is useful to work in terms of excess returns defined relative to the risk-free rates. If we let R_{Fk} be the risk free return of currency k and, R_{base} be the corresponding risk-free for the base currency, the above equation can be

written as,

$$R_n - R_{base} = (L_n - R_{Fk}) + (R_{Fk} + E_k + R_{Fk} E_k - R_{base}) + (L_n - R_{Fk}) E_k$$

This result decomposes the base excess return into **local excess return**, which answers the question of whether the local asset outperforms the local risk-free rate.

The second component is the **currency excess return**, which answers whether holding cash in currency k outperforms holding cash in the base currency. A positive exposure to a currency that outperforms the base currency contributes positively to the portfolio currency effect. The net currency effect is due to both holding cash and risky assets.

The third component, **cross product,** arises from the conversion of local excess profits into the base currency. This is usually a small component and is significant only if there are large local excess returns and large exchange-rate fluctuations. This does not arise from any active management decisions, but is simply a combined effect of the local investment and the currency exposure decisions.

Another key concept here is that of **currency overlay techniques**, which are used to manage the currency exposure and sometimes also benefit from it. The exposures of all the foreign currencies are combined and managed separately from the assets. The exposure can be passively hedged using forward currency contracts, currency swaps, futures or options. The exposure can also be actively managed with timing decisions based on views of exchange rate performance. Here a decision needs to be made and constantly revised regarding the ratio of the total currency exposure that needs to be active managed versus passively hedged. Here again, views can be formed based on different types of models that use fundamental factors (interest rates, balance of payments, capital flows, etc.); technical factors (based on price history); trading factors (based on options or interest rate spreads etc.) or combinations of the three. Depending on the choice of the exposure management strategy, further attribution of the currency return into these factors might be necessary.

15. Conclusion

With the foundation provided by the Uncertainty Principle of the Social Sciences, we looked at the fundamental characteristics of the Equity Asset class and how trading strategies can be formulated. Once these strategies are formed, we delved into the Portfolio Construction, Portfolio Implementation, Risk Management, Rebalancing and Performance Measurement of the resulting Portfolio. We also established a way to systematically form a confidence level for any views we formulate in the Black Litterman model, as part of deriving the portfolio weights. Finally, we looked at the trading costs associated with implementing an equity portfolio with a brief foray into the implementation costs for other asset classes.

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Private and Public Investment in Africa: A Time-Series Cross-Country Analysis

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Abstract

Times-series cross-country approach is used to empirically investigate the relationship between private investment and public investment. We use panel data for the period 1980–2010. Independent variables like public investment, gross domestic product, trade openness, external debt stocks, domestic credit to private sector are integrated in the model. This helps to take into account the impact of gross domestic product, external debts stocks and domestic credit policy on how public investment affects private investment. Empirical results of this paper demonstrate that these independent variables (except, credit to private sector) are significant at 1% level and that the associate parameter η is equal to -66.972 means that public investment negatively affect private investment. Public investment crowds out private investment. There is a substitution effect between private investment and public investment. Improvements in public expenditures may not directly increase private investment.

Keywords: private investment, public investment, crowding effect, times-series cross-country

1. Introduction

Private and public investment evolution is a critical topic for Africa's economic growth and poverty alleviation nowadays. Since, the analysis of the productive role of private and public financial and physical capital has been early developed in the years 1940–1950, following by the discussions around the balanced growth initiated by development theorists (Rosenstein-Rodan, 1943; Nurkse, 1952; Hirschman, 1958), the debate related on the theme of economic take-off has also been awarded to date, in particular through new models inspired by the problem of Big Push (Murphy, Scheiffer, & Vishnu, 1989).

Investment is a mechanism use to accumulate the innovative produced financial and physical capitals, such as factories, machineries, buildings, and goods inventories. Also, investing in finance is the act of buying a personal asset and expecting that the financial capital will produce revenues, like interest and/or dividends. All categories of financial and physical investments are involving in some type of risk. These risks are investment in equities, property, and even fixed interest securities (subject to inflation risk). To manage the risks related to the investment, it is important for public and private project investors to first identify it and second to integrate it in the financing process. In the related literature, many forms of investment are found: direct or indirect (portfolio), internal (national) or external (foreign), public or private.

The main role of the private investment is to increase the capital stock of the productive assets held by the national or domestic private sector. The replacement of the existing capital stock and the creation of additional capital stock embodying new and innovative technology are the very important motivations. The literature related on endogenous growth nowadays includes human capital in this definition. In essence, investing in education and training the workforce (managers, entrepreneurs and the society) are considered as variables of human capital (Paterson, 1999). The private physical investment can be categorized in two: the infrastructures (buildings, housing, logistic sites) and equipments (machineries and transport). Investments in equipments are considered to be the key factors which influence short-run economic growth, and investments in human capital impact endogenous growth models in long-run.

Public investment can be dividing into many broad forms: investment in physical capital, in infrastructure, for example, including transport and telecommunications networks; investment in human factors such as human

capital, for example, investment in education and in training; investment in technical progress, for example, research and development; investment in plant and equipment (Paterson, 1999). Public investments in some key and training effect sectors are closely in relationship to the enhancement of the innovative and productive capacity of the domestic economy. Indeed, without public investment in different domains like: road, rail, air, and waterway transport, and telecommunications networks production, private or public financial, physical transaction and trade would not be possible. In these areas, investments whether or not involving public/private partnerships (PPP), should be regarded in the same way as domestic private investment in productive assets. The implications of this point for the financing of such projects impact on national government budgets. Private capital, as far as development of the physical investment base of the economy is concerned, is clearly not competitive with this form of public investment. Such investment should be protected because it can either be provided with public expenditures, and/or a mixture of public and private funding.

Essentially, a fundamental distinction can be made when comparing both public capital and private capital. In fact, public capital directly managed through governments is discretionary. While private investments are influenced by expectations of anticipated returns, uncertainty and cyclical economic variations, public investments are not. Therefore public investments can be provided on a stable basis, without regard to any uncertainty and cyclical economic variations, more correctly designated as uneven economic growth patterns. Public investment is argued and considered as one of the important business stimulus and engine to private investment. Public and private capital can be correlated or can be in relationship by a complementarity or substitute link if public investment exerts positive or negative stimulus on the private sector through private investment. The positive effect pushed by public investment towards private investment may be explained by the public capital hypothesis (Aschauer, 1989). According to this hypothesis, when public investments raise the consequence is that the private investments also increase.

The effect of private capital on public capital or the impact of public investment on private investment is theoretically ambiguous and indeterminate. These effects may be insignificant (neutral effect), negative (substitution effect or crowding) than positive (complementarity effect or training). Pervious empirical studies on the effects and existing inter-linkages between aggregate private and public investment have generally followed two methods. The first method is the use of national aggregates as explanatory variables for the topic under review. The second approach entails using individual firm and/or industry-specific explanatory variables to explain investment behavior. Most of these studies have used time series analysis with a few opting for panel data analysis. The flexible accelerator model was one of the models used to empirically estimate investment behavior (Muyambiri et al., 2010). The accelerator model was propounded by Clark (1917). However, it has been less preferred as a model because of its stringent assumptions and an adjustment coefficient of investment equal to unity. The accelerator model with an adjustment coefficient equal to unity was rejected in tests by Kuznets, Tinbergen, Chenery, Koyck and Hickman (Jorgenson, 1971). The flexible accelerator model is used as an alternative in most investment studies.

Is the link between private and public investment found to be significant or not significant? Is the direction of causality found to be unidirectional or bidirectional? Do public investments exert positive, neutral or negative effects on private investment? Do private investments influence positively, negatively or neutralize public investments? The aim of this paper is to analyze the relation between private investment and public investment. This paper provides evidence on the correlation between private investment and public investment by using a time-series cross-country analysis approach in fourteen African countries. The contribution of this research lies in the fact that the application of time-series cross-country approach has never been widely used in this kind of study in Africa, particularly in private and public investment analysis. Thus, the contents of the study are as follows. Literature review is presented in section 2. The methodology with the econometric model and the data sources is presented in section 3. Section 4 presents and discusses empirical results, and the last section concludes.

2. Review of the Literature

A considerable number of previous theoretical studies and empirical researches have generally been done on the investment and particularly on the determinants of investment, on the public capital and on the private investment. Some authors have agreed that private and public investments positively impact economic growth. There is not a consensus on the link between public or private investment (Erden & Holcombe, 2006). Using the case of developed economy in 1980s, (Aschauer, 1989) shows that the decreasing in public infrastructure expenditures confirms that the part of the productivity does not increase. A large part of literature and researches that analyzed whether public capital leads to participate in increasing output growth and/or the productivity of private investment have followed these studies: (Munnell, 1990; Khan & Reinhart, 1990; Barro, 1990; Easterly & Rebelo, 1993; Tatom, 1991, 1993; Evans & Karras, 1994a, 1994b; Ramirez, 1998; Khan & Kumar, 1997).

The literature related on the investment in the underdevelopment countries (Gankou, 1985) and on the effect of public investments on private investments in developing economies gives inconsistent results on whether the complements each other, substitutes or public investment crowds out private investment. Erden & Holcombe (2005) have applied several pooled specifications of a standard investment model to a panel of developing economies for 1980 to 1997 and identify that public capital complements private capital. They also run the same empirical models on a panel of developed economies to show that public investments crowd out private investments in developed economies. The empirical evidences show that in some important ways, private investments in developed economies are influenced by different factors than private investments in developing economies. Investigations made by Ahmad and Qayyum (2008), Ghura and Goodwin (2000), Oshikaya (1994), Ramirez (1994) have found that the two types of investment are positively correlated (Muyambiri et al., 2010). Faini (1994) analyzes whether there is a training effect or a substitute (crowding out) effect between public investment and private investment in Africa. Touna Mama, Kamgnia Dia, Ouédraogo and Zeufack (2002) using vector auto-regressive (VAR) estimates to empirically indicate the key determinants of the private capital in some francophone African countries, have showed that private investment can be substituted to public investment. In the case of the developed countries, Pereira (2001) has tested the impacts of governmental investment on the evolution of private investment and the empirical findings suggest that at the macro level, private investment can be substituted to private investment.

Crowding out is argued and considered by some authors to appear when government borrowing increased, fiscal policy expansion reduces investment spending. Basically, crowding out was reflected the increasing in the interest rates from the borrowing. But that was broadened to multiple channels (Blanchard, 2008). One of the channels of crowding out is the reduction in private investments. This occurs because government increases his borrowing to finance his infrastructural expenditures. A rising in government expenditures and/or a decrease in revenues from taxation lead to a deficit that is financed by increased borrowing. The borrowing can, then, increase interest rates and conduct to a reduction in private capital.

The hypothesis of crowding out raises an important issue that concerns the opposition between the financing of public investment and the private investment. But when the investment in question addresses a large proportion of infrastructure, in education or in research and development rather than public consumption, the case of crowding out can not clearly be applied. In addition, the threat is that public investment is the expense item as easily penalized in case of budget restrictions.

Investment in public infrastructure and governmental capital also affect private investment through other various channels: complementarity impacts, output and relative price effects (Agénor, Nabli, & Yousef, 2005). The complementarity effect asserts that public capital (as opposed to public investment) in infrastructure may stimulate private physical capital formation because of its impact on private economic activities. By raising the marginal productivity of private inputs (both labor and capital), it raises the perceived rate of return on, and increases the demand for, physical capital by the private sector. Alternatively, a complementarity effect between public capital in infrastructure and private investment may operate through adjustment costs. In a context of economic growth, this idea is found on the availability and the quality of public capital in infrastructure (Turnovsky, 1996). For example, a better integrated road can reduce costs associated with the construction of innovative and new factories or the displacement of heavy equipments. Cohen and Paul (2004) analyze that in many countries, the effect of private investment on unit production expenses and the productivity can be substantial. By reducing production expenses and increasing the expected rate of return, public investment in basic infrastructures can have a strong effect on building private investments.

Public investment and governmental capital in basic infrastructure can not directly affect private investment in formation, through changes in outputs and relative prices. Public investment in infrastructure may increase the marginal productivity of existing factor inputs (both capital and labor), thereby reducing marginal production expenses and increasing the level of private production. In turn, this scale impact on output can conduct, through the accelerator effect, to higher private capital (Chirinko, 1993). Moreover, if there are externalities associated with the use of some production factors a positive growth effect can result. Agénor, Nabli and Yousef (2005) analyze that public infrastructure can also indirectly impact private investment through its flow effect on the price of domestic consumption goods relative to the price of imported goods: that is, the consumption-based real exchange rate. An increase in public investment in infrastructure for example will increase aggregate demand and domestic prices in addition to stimulating output.

In the context of countries in the developing world the relationship between private and public investment (in terms of crowding in and crowding out) has been a major focus of analysis. Beyond the relationship between private and public investment, the concern for private investment has been in terms of its impact on economic

growth. The authors who have contributed to investment analysis in Africa are: Oshikoya (1994), Mlambo and Oshikoya (1999), Devarajan et al. (1999), Mataya and Veeman (1996), Khan and Reinhart (1990), and Gunning and Mengistae (1999). Writing on the macroeconomic determinants of domestic private investment in Africa, Oshikoya (1994) found a positive relationship between public investment and private investment. The study spanned 1970 to 1988 and covered seven African countries, namely, Cameroon, Mauritius, Morocco, Tunisia, Kenya, Malawi and Tanzania. Though public investment ratios had fallen in some of the countries, particularly in Mauritius and Morocco, a strong positive effect of public investment on private investment was observed. The results suggested that: the productivity of these forms of investment may be as important as their magnitude in influencing private investment (Osikoya, 1994). Analyzing the same relationship, Mlambo and Oshikoya (1999), using a sample of 18 African countries for the period 1970 to 1996, found that fiscal, financial and monetary policy, macroeconomic uncertainty and trade variables were significant determinants of private investment in Africa. The study also found political stability to be a major factor in the determination of private investment rates on the continent.

Shafik (1992) found that public investment tends to crowd out private investment through its effect on credit markets, and to crowd it in through investment in infrastructure. Dhumale (2000) finds that public investment in basic infrastructure appeared to have a crowding out effect in oil-exporting countries, and a crowding-in effect in the non oil-exporting countries. The author has used a model that accounts for credit to the private sector and the accelerator effect. Everhart and Sumlinski (2001) find a neutral effect which means that the effect of public investment on private investment is not significant. The authors used a methodology found on the panel tools and a proxy to capture the quality of public investment to empirically analyze the relationship.

3. Methodology: Model and Data

3.1 Model

From Paterson (1999), neoclassical models, first, with technology considered as given or exogenous to the model (Solow, 1956) and, second, with technology determined inside the model or endogenous to the model (Romer, 1986; Lucas, 1988) we have constructed a theoretical model based on Cobb-Douglas function. From Sundararajan & Thakur (1980), Ram (1993), and Erden and Holcombe (2006), the model developed by these authors is a modification of the neoclassical model that incorporates the effects of public investment and uncertainty, and specifies the dynamic structure of private investment as an error correction mechanism. According to the neoclassical model of investment, incorporating public capital into the optimization problem of a representative firm under certainty, the optimal or steady state level of the private capital stock is expressed as a function of quantity of public capital (PUI_{it}), output (GDP_{it}), and the user cost of capital (C_t which can be expressed by external debt stock, domestic credit to private sector among others):

$$PRI_{it} = F\ (PUI_{it},\ GDP_{it},\ C_{it}) \tag{1}$$

The model constructed for time-series cross-country estimation shown by equation (2) is based on the modification of models developed from the previous studies. In contrast to other models, this model incorporates the effects of interaction variables (gross domestic product, trade openness, external debt stocks, domestic credit to private sector and population) and the dummy variable to establish the corresponding correlation between private investment and public investment:

$$PRI_{it} = \phi + \eta \ln PUI_{it} + \omega_1 \ln GDP_{it} + \omega_2 \ln TO_{it} + \omega_3 \ln EDB_{it}$$
$$+ \omega_4 \ln CRP_{it} + \omega_5 \ln POP_{it} + \sum_{1 \leq j \leq 2} \alpha_j D_j + \zeta_i + \varepsilon_{it} \tag{2}$$

where, PRI, our dependent variable, represent the private investment; PUI, GDP, TO, EDB, CRP and POP are the explanatory variables and respectively represent public investment, gross domestic product, trade openness, external debt stocks, domestic credit to private sector and population; Φ the constant parameter, η, ω_k for $k=1$, ..., 5 the associate parameters; D_j represent regional dummy variables. More precisely, D_1 represent the Economic Community of African States (hereafter Central African Countries Economic Community- CEEAC) dummy variable and D_2, the West African Country-CEDEAO. The letter ln before the explanatory variables indicates the natural logarithm operator; ε is the rest of the disturbance and ζ is the cross section specific effect; the subscripts $i = 1, 2, ..., 14$ and $t = 1, 2, ..., 30$ respectively indicate the country and the time. In this study, our main focus is the private-public investment relationship, and we attempt to investigate it by analyzing the statistical significance of the associate parameter η. The sign (negative and/or positive) of this parameter of our econometric model will indicate the effects of the dependent variable PRI on the independent variable PUI with panel data.

3.2 Data

To conduct this regression, we use panel data drown out from World Bank contained in the World Development Indicators (2012). The sample contains fourteen countries which are regrouped in three; the West African Countries (CEDEAO)–Benin, Côte d'Ivoire, Gambia, Ghana, Mauritania, Senegal, Sierra Leone, the Central African Countries (CEEAC)–Cameroon, Chad, Congo Democratic Republic, and Gabon–and the other countries which contains Tunisia, Zambia and Zimbabwe. The sample period is from 1980 to 2010.

We calculated the trade openness as the aggregate values of imports and exports of commodities and services. Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. Imports of goods and services represent the value of all goods and other market services received from the rest of the world. Data are currently expressed in U.S. dollars. GDP (gross domestic product) at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Domestic credit to private sector refers to financial resources provided to the private sector through loans, purchases of non-equity securities, trade credits and other accounts receivable that establish a claim for repayment. For some African countries in our sample these claims include credit to public enterprises.

4. Empirical Results: Presentation and Discussion

Equation (2) is estimated using time-series cross-country analysis with data over the period 1980 to 2010 for 14 selected African countries. The procedure and empirical results are reported in the following Tables.

4.1 Test on the Cross Specific Effects

The fixed effects test (Table 1) was used to analyze the significant cross specific effects or not of the correlation between private investment and public investment in the 14 African countries.

Table 1. Test of fixed effects

Fixed effects (within) regression		Number of obs = 434				
Group variable: id		Number of groups = 14				
R-sq:		within = 0.5115		min = 31		
		between = 0.9368		obs per group: avg = 31		
		overall = 0.7840		max = 31		
Corr (u_i, xb) = 0.5629		F (5, 415) = 86.89				
		Prob > F = 0.0000				
pri	Coef.	Std-err	t	P > |t|	[95% conf. interval]	
lpui	- 68.58039	3.702072	-18.52	0.000	-75.85755	-61.30324
ledb	-2.460473	.8280758	-2.97	0.003	-4.088219	-.8327273
lpop	-.8627238	2.065009	-0.42	0.676	-4.921906	3.196458
lgdp	6688411	3.522309	18.99	0.000	59.96032	73.80791
ltot	6.192772	1.080413	5.73	0.000	4.069008	8.316537
_cons	-1378032	20.23239	-0.68	0.496	-53.55106	25.99043
sigma_u	4.1533107					
sigma_e	5.85555009					
rho	.33471156	(fraction of variance due to u_i)				

Note. F test that all u_i = 0; F (13, 415) = 5.70; Prob > F = 0.0000.

Table 1 presents the within analysis and following by the related results. The F test demonstrates that there is a significant specific effect in the model since the *p*-value is less than 1 %. Thus the pooled regression cannot be applied here. The individual-specific effect is now subject to be considered as random variable. That is uncorrelated with the explanatory ones -and then, a part of the error term- then, random effects estimation will be applied. So the Hausman test will be conducted to choose the appropriate approach: fixed effects method or random effects method.

4.2 The Hausman Test

The results of the Hausman test are presented in Table 2.

Table 2. The Hausman test

	(b) Fixe	(B)	(b-B) difference	sqrt[diag V_b-V_B] S E
			Coefficients	
lpui	-66.68228	-66.97193	.2896532	.8292147
lgdp	63.72903	65.187	-1.457968	1.167011
ltot	6.809182	7.023786	-.2146035	.4246522
ledb	-2.079959	-1.036111	-1.043848	.3995225
lcrp	.022724	-.0947879	.1175119	.2836501
lpop	-.0732393	-4.319802	4.246563	1.471868

Note. b = consistent under Ho and Ha; obtained from xtreg;

B = unconsistent under Ha, efficient under Ho; obtained from xtreg;

Test: Ho: difference in coefficients not systematic;

chi2 (6) = (b-B)' [(V_b-V_B) ^ (-1)] (b-B) = 18.58;

prob > chi2 = 0.0049.

The *p*-value is less than 1%, so that the random effects regression is preferred. The equation (2) will be estimated using random effects method.

4.3 The Random Effects Estimation

Table 3. Test of random effects

Random effects GLS regression	Number of obs = 407	
Group variable: id	Number of groups = 14	
R-sq:	within = 0.6076	min = 18
	between = 0.9795	obs per group: avg = 29.1
	overall = 0.8760	max = 31
Corr (u_i, x) = 0 (assumed)	Wald chi2 (9) = 1040.85	
	Prob > chi2 = 0.0000	

Pri	Coef.	Std-err	z	P > |z|	[95% conf. interval]	
lpui	-66.97193	3.022489	-22.16	0.000	-72.8959	-61.04796
lgdp	65.187	2.836437	22.98	0.000	59.62768	70.74631
ltot	7.023786	.8199209	8.57	0.000	5.41677	8.630801
ledb	-1.036111	.5427919	-1.91	0.056	-2.099964	.0277411
lcrp	-.0947879	.4796125	-0.20	0.843	-1.034811	.8452353
lpop	-4.319802	.8805288	-4.91	0.000	-6.045607	-2.593997
CEMAC	-.1458061	2.791192	-0.05	0.958	-5.616442	5.32483
WAC	-3.848548	2.563275	-1.50	0.133	-8.872475	1.175379
OTH	-1.973126	2.733622	-0.72	0.470	-7.330926	3.384675
_cons	-3.606334	11.05021	-0.33	0.744	-25.26434	18.05167
sigma_u	1.8183582					
sigma_e	4.6194485					
rho	.13415818	(fraction of variance due to u_i)				

From Table 3, the R-squared between is equal to 0.9795 and is upper than 75 %. This means that the specification of the model is well done.

Table 4. Presentation of the results of the relationship between private and public investment

	F. E. regression	R. E. regression	GLS regression
Pub. Inv.	-66.682	-66.972	-64.848
	(3.134)***	(3.022)***	(2.774)***
GDP	63.729	65.187	64.653
	(3.067)***	(2.836)***	(2.546)***
Trade Openness	6.809	7.024	6.037

	(0.923)***	(0.820)***	(0.745)***
Ext. Debt	-2.080	-1.036	-0.384
	(0.674)***	(0.543)*	(0.462)
Cred. to P. Sec.	0.023	-0.095	-0.414
	(0.557)	(0.480)	(0.383)
Pop	-0.073	-4.320	-5.897
	(1.715)	(0.881)***	(0.565)***
CEMAC		-0.146	-1.430
		(2.791)	(1.376)
CEDEAO (WAC)		-3.849	-4.510
		(2.563)	(1.291)***
OTH		-1.973	-2.735
		(2.734)	(1.376)**
Constant	-19.882	-3.606	-5.252
	(17.635)	(11.050)	(6.256)
R^2	0.61	0.97	
N	407	407	407

Note. standard errors are in brackets; and the stars ***, **, * indicate the significant level respectively at 1%, 5% and 10%.

From the Table 4, we note that the explanatory variables like public investment, gross domestic product, trade openness, external debt stocks and population are significant at 1 % level. Their estimated associate coefficients are respectively: $\eta = -66.972$, $\omega_1 = 65.187$, $\omega_2 = 7.024$, $\omega_3 = -1.036$, and $\omega_5 = -4.320$. Only the credit to private sector is non-significant. The reason could be the fact of the existence of some missing values. The membership of some African countries to Central Africa economic zone, West Africa region and other African regions is clearly specified in the model. The corresponding estimated coefficients are -0.146 for CEEAC, -3.849 for CEDEAO and -1.973 for others (Tunisia, Zambia and Zimbabwe).

Using the random effects, the R-square is equal to 0.97 showing the strong correlation between the two variables. In Africa, private investment and public investment are in relationship. The associate parameter $\eta = -66.972$ shows the negative effect of public investment on private investment. The results present not a complementarity effect between the two types of investments but a substitution effect, suggesting that government investments not encourage more private investments. These evidences corroborate with the contribution of Sundararajan & Thakur (1980) in the case of India and Korea. But with Faini (1994) and considering the basic public expenditures done by some African countries in sectors like energy (for example, electricity), telecommunication and transport, we can discuss the impact of crowding out and the training effect of the public investment on the private investment in Africa. African governments usually take many years to build basic infrastructures in the complementary and training sectors. Oshikaya (1994) and Ramirez (1994) respectively for empirical analysis in Africa and in Mexico have shown the complementarity of the two investments. Our empirical findings support the idea that private investment substitutes public investment in the 14 selected African countries.

5. Conclusion

This study aimed to investigate the relationship between private investment and public investment in some African countries. Some main conclusions from the econometric results are highlighted. The complementarity effect between private investment and public investment is not justified. The findings support the idea that private investment is a substitute of public investment, and also suggest that government expenditures do not encourage more private investment.

The ultimate objective is to promote private investment. Public and private investments are linked by a substitution relation. Public capital and basic infrastructural expenditures have positive impacts on the private sector. It could be counterproductive if some private investment led to unsustainable infrastructure development that posed a huge financial burden on the host government. The main goal is to sustain economic growth and poverty reduction that could happen at the end of a long and complex process involving many actors and interventions.

Nevertheless, when private investment is deemed to make major contributions to this goal through a specific public infrastructure plan, then development partners should collectively look at what they can do more (ameliorate for example business climate) to help improve the enabling environment and provide effective public or private financing tools. The implication for policy is to foster and support economic growth in African

countries. Closer attention should be given to key factors that promote private investment like public investment in basic infrastructures: energy offer, transport and telecommunications networks. African governments have to improve the productivity of theirs investments so as to generate positive returns and enhance their complementary role to private sector and private investment. Further researches in this area have to perhaps use the same methodology with disaggregated public investment data.

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Managerial Ownership, Leverage and Dividend Policies: Empirical Evidence from Vietnam's Listed Firms

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Abstract

The purpose of this paper is to examine the interrelationship among managerial ownership, leverage and dividend policies. The analysis is performed using three-stage least squares (3SLS) estimation on a sample of 81 listed firms on HCM City Stock Exchange (HOSE) during the period 2007–2012. The empirical results indicate that managerial ownership has a negative relationship with leverage. This finfing is supported by *Agency Theory*. Also, the results provide strong support for *Pecking Order Theory*, which suggests that there is a negative relationship between leverage and dividend. However, contrary to expectations, managerial ownership is found to have positive impact on dividend. It means that companies with higher levels of managerial holdings are consciously choosing higher level of dividends.

Keywords: managerial ownership, leverage, dividend, interrelationship, 3SLS, Ho Chi Minh City's stock exchange

1. Introduction

The role of managers is to maximize shareholder's wealth. However, managers who do not have a significant ownership in the firm may have incentives to make decisions which are not at the best interest of shareholders. Such conflicts will lead to agency problem and incur significant costs. Corporate governance has emerged as an important issue for Vietnamese-listed firms in the broader context of financial development. Most Vietnamese-listed firms were privatized from State-Owned Enterprises. The government is generally a major shareholder after the firms go public and managers are delegated to act on their behalf. As a result, it is expected that managers of these firms will act on the interest of the controlling shareholders. Nevertheless, in recent years, there have been a number of company scandals from corporate governance failures involving in managerial opportunism. Eventually, achieving the goal of maximizing the value of the firm often becomes unattainable.

Previous studies suggest that corporate ownership structure and financial policies can affect firm's performance and value by mitigating agency costs of the firm. A large body of literature indicates that insider ownership helps aligning managerial interests with those of the external shareholders (Jensen, 1986; Fama, 1980). Debt holders and related monitoring tools are also considered important mechanisms for controlling managerial behavior and mitigating the agency problems (Jensen & Meckling, 1976; Rozeff, 1982; Easterbrook, 1984; Stulz, 1990; Bathala, Moon, & Rao, 1994). Given the array of internal monitoring tools that can be used to resolve agency problems, owners of the firms can adopt a combination of these policies. This also implies that a firm's managerial ownership, leverage and dividends might be simultaneous and there is substitution effects between the three financial variables directly related to each other (Jensen, Solberg, & Zorn, 1992; Chen & Steiner, 1999; Crutchley, Jensen, Jahera, & Raymond, 1999).

Prior empirical studies have been conducted to mainly investigate each policy independently in the context of Vietnam. In light of the direct relationships among these policies, empirical studies on this topic are limited in the Vietnamese context. As such, this paper empirically analyzes the relationship between a firm's managerial ownership, leverage and dividend policies. According to Kim, Rhim and Friesner (2007), this clearly has the potential of creating an endogeneity problem and thus the use of simultaneous equation models is essential in the empirical test. These equations are estimated using the Three stage least squares (3SLS) technique and each

equation includes each of the three policy choices. To these equations, several explanatory variables are also added to capture real attributes of firms such as (i) free cash flow, (ii) firm size, (iii) growth, (iv) liquidity, (v) profitability and (vi) tangibility.

The finding of research is expected to make several contributions to the existing literature. First, it provides evidences to reinforce the notion of simultaneously determined corporate monitoring forces (managerial ownership, debt and dividends). Second, it contributes to the growing number of papers using 3SLS estimation as an alternative to ordinary least squares (OLS) regression. The basic assumption of OLS estimator is that exogenous variables are uncorrelated to the residual terms. Therefore, in terms of explaining causality among these policies, the OLS produces biased and inconsistent estimates. Lastly, it contributes additional explanations on Agency Theory and Pecking Order Theory in the context of the Vietnamese financial market.

The remainder of this paper is structured as follows. Following this Introduction, Section 2 presents a review of the relevant literature, covering the fundamental theoretical discussions that aim to consider that the managerial ownership, financial leverage and dividend payout are interdependent. It concludes with the specification of the main hypotheses to be tested. Section 3 describes the sample of firms, variable definitions, data sources, and the methodology. Section 4 reports the results of the empirical tests and Section 5 concludes the paper with policy implications.

2. Literature Review and Hypothesis Development

Examining the possible relationship between managerial ownership, leverage and dividend policy requires some theoretical platform. The main theories on these issues are briefly discussed including (i) agency theory, (ii) signaling theory and (iii) pecking order theory. This section concludes with a discussion of the interrelationship among managerial ownership, financial leverage and dividend policy.

2.1 Agency Theory

According to the agency model of the firm initiated by Jensen and Meckling (1976), the modern corporate organization is subject to agency conflicts arising from the separation of ownership and management in the firm. In this setting, managers have an incentive to consume excessive perquisite rather than to maximize shareholders' wealth. *Agency theory* suggests several mechanisms to mitigate agency problem, three of which are relevant to this study. One mechanism suggested by Jensen and Meckling (1976) is to increase the ownership of the managers in the firm, thus forcing managers to bear the wealth consequences of their actions. Consequently, managerial ownership can serve as governance mechanism in aligning the interest of mangers with that of the external shareholders. Sundaramurthy and Lewis (2003) emphasized the role of managerial ownership in controlling managerial opportunism in the firm. In addition, Vo and Phan (2013) found that the increase in managerial ownership will improve the performance of firms in Vietnam. However, when managers hold a significant portion of a firm's equity, an increase in ownership may prevent them from being replaced or punished for their improper decision and this results in managerial entrenchment. Once entrenched, managers are likely to consume more perquisites or to reduce the firm's risky investment opportunities to protect their own interests (Morck, Shleifer, & Vishny, 1988).

The second mechanism to reduce agency cost is to force the firm to use leverage or debt financing (Rozeff, 1982; Easterbrook, 1984; Jensen, 1986). The increase of debt will lead to risk of corporate bankruptcy and job loss that further motivate managers to use the cash flow efficiently and reduce their perks. In addition, with high debt, managers are under pressure of investing profitable projects to generate cash flow to make periodic payments of interest and principal.

Rozeff (1982) and Easterbrook (1984) make a similar argument that dividend payment can be used as an internal mechanism to reduce agency cost. Paying larger cash dividends increases the chance that external equity capital will have to be raised to finance existing and future investment. When the firm issues more new securities, managers are monitored by capital market (Emery & Finnerty, 1997). This monitoring induces managers to act more in line with shareholders' interests.

2.2 Signaling Theory

Signaling theory focuses upon the asymmetric information between insiders, as managers; and outsiders, as shareholders and banks. Ross (1977) assumes that managers have better knowledge of firm's investment opportunities than outsiders. Outsiders usually face a great deal of information asymmetry concerning the real value of firm's present and future investment. Therefore, outsiders consider any change in capital structure and dividend policy as signals of the firm's performance. If managers decide to add more debt into capital structure, outsiders will interpret it as a signal of higher future cash flow (Ross, 1977). However, if managers decide to

finance the firm by issuing new equity, it signals that firm has unfavorable prospects and attempts to look for new investors to share the losses. Thus, the higher level of leverage shows the higher confidence of manager in the firm's performance in the future.

Similarly, dividends are also suggested as generating a positive signal to outsiders because only firms with high level of profitability in the future can issue dividends. Consequently, the higher are dividends relative to retained earnings, the stronger is the expectation of managers on firm's future income as a means of maintaining the current dividend payout level.

In addition, Leland and Pyle (1977) argued that the equity held by managers can serve as substitute signal of firm quality. Managers will only be willing to invest considerable holdings in firm's stocks when they are convinced that the firm has delightful prospects in the near future (Busenitz, Fiet, & Moesel, 2005).

2.3 Pecking Order Theory

Pecking Order Theory explained that firms follow a hierarchy of financial decisions when establishing its capital structure. According to this theory, a profitable firm is more likely to finance projects from the internal funds rather than external funds (Myers & Majiluf, 1984; Friend & Lang, 1988; Rajan & Zingales, 1995). Initially, firms first finance projects with the retained earnings. If the retained earnings are not sufficient, the firms go for debt and if further financing is required, the last option for the firm is to issue equity. The retained earnings is preferred over debt and equity because retained earnings almost incur no flotation costs and require no disclosure of the firm's financial information. On the contrary, the external sources are used for financing like issuing of new shares may incur very high cost (Myers, 1977). Since this is expensive, it may lead to lower dividends.

The above discussions on the three theories imply that managerial ownership, debt and dividend policies are all useful in mitigating agency costs and resolving information asymmetry of a firm. However, these mechanisms are used with the costs. Excessive level of ownership held by managers may lead to entrenchment problems. As managers become entrenched, they require increasing amount of compensation (Morck et al., 1988). The use of debt financing may result in substantial costs including bankruptcy costs and debt agency costs incurred as debt holders have to bear higher risk. Additionally, similar to the use of debt, dividend payout policy is not costless. Since external capital is raised to pay for the dividends, substantial flotation costs will be paid to investment bankers (Crutchley & Hansen, 1989). As such, firms may find that it is optimal to utilize the combination of debt and dividend as well as managerial ownership to control agency conflicts in the firm.

2.4 The Interrelationship between Managerial Ownership and Leverage

Leland and Pyle (1977), Kim and Sorensen (1986), Stulz (1988) argued for a positive relationship between managerial ownership and leverage. Firms with higher managerial ownership have greater debt ratios than firms with lower managerial ownership to avoid the costs of external equity. The use of debt will reduce the need for external sources and thus increase the percentage of managerial ownership. Alternatively, owners of high managerial ownership firms may try to avoid diluting their control over the firm by issuing more debt (Kim & Sorensen, 1986). On the other hand, findings of Agrawal and Mandelker (1987) study implicate that the higher is the managerial ownership, the greater is managers' willingness to accept the financial risk associated with an increase in financial debt.

On the other hand, Friend and Lang (1988), Jensen et al. (1992), Bathala et al. (1994), Chen and Steiner (1999) argued that higher managerial ownership will decrease leverage. Managers who have ownership in a firm with high debt ratios tend to suffer from higher risk than do owners. At one end of the spectrum, managers will face with the high risk of losing job when the company uses high level of debt. At the other end of the spectrum, the risk of bankruptcy increases with excessive use of debt and accordingly reduces the value of firms. Consequently, managers will strive for reducing the risk of losing job and personal wealth in their own portfolio by decreasing debt.

Based on these theoretical and empirical works, the study hypothesizes that:

Hypothesis H$_1$: There is a negative relationship between managerial ownership and leverage.

2.5 The Interrelationship between Managerial Ownership and Dividend Payout

Empirical studies, such as Rozeff (1982), Jensen et al. (1992), Eckbo and Verma (1994), generally found that a relationship between managerial ownership and dividend payout is negative. It means that firms with higher managerial ownership tend to increase internal funds at the expense of low dividend payouts in order to finance investments. Jensen (1986) also provided evidence that managers are reluctant to pay dividend. Alternatively, Chen and Steiner (1999), Kim et al. (2007) explained that both managerial ownership and dividends resolve

agency problems. Therefore, managerial ownership and dividends may be thought of as substitute mechanisms geared at reducing agency costs, then it will be ineffective to use two tools at the same time to solve the same problem. Lower dividend will increase the probability that a firm engages in managerial ownership program and vice versa.

On a ground of the above analysis, a research hypothesis is developed as below:

Hypothesis H₂: There is a negative relationship between managerial ownership and dividend payout.

2.6 The Interrelationship between Leverage and Dividend Payout

According to *Pecking Order Theory,* firms prefer to fund projects with its retained earnings (Myers & Majluf, 1984). If a firm pays out significant amount of dividend, this will lead to the decrease in free cash flow and then to raise the need for additional sources of external financing to maintain its optimal capital structure (Emery & Finnerty, 1997; Easterbrook, 1984). Furthermore, debt was found to be positively related with dividend payout when both can be used to send a strong positive signal to outsiders to enhance the firm's value and to maintain access to capital market (Myers & Frank, 2004).

On the contrary to the positive perspective, Jensen et al. (1992), Faccio, Lang and Young (2001) provided the negative relationship between leverage and dividends. A firm acquiring debt will have fixed financial charges, interests and repayment of principals and thus leads the firm into liquidation. As a consequence, the firm has tendency to pay lower dividends to maintain good liquidity position and cash flow. In adapting the *Agency Theory* argument, Rozeff (1982), Jensen (1986), Faccio et al. (2001) concluded that debt and dividend may be a substitute mechanismin reducing free cash flow that may be misused by managers.

In view of the *Agency Theory*, the research hypothesis is formed as below:

Hypothesis H₃: There is a negative relationship between leverage and dividend payout.

In short, the discussion on the interrelationship between managerial ownership, leverage and dividend is summarised by Figure 1.
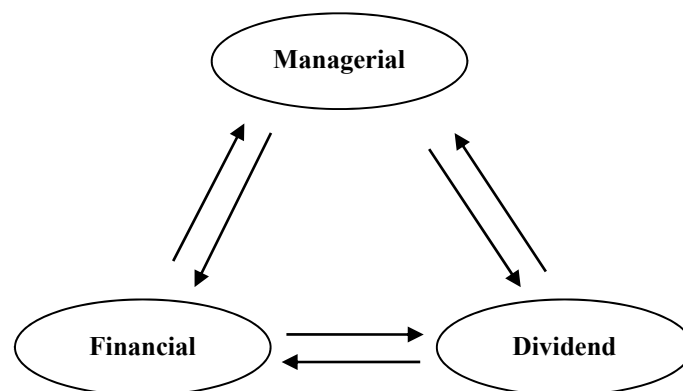

Figure 1. The interrelationship between managerial ownership, leverage and dividend policies

3. Sample and Methodology

The review of the empirical studies presents the role of managerial ownership, leverage and dividends, as mechanisms controlling agency conflicts in the firm. Jensen et al. (1992), Chen and Steiner (1999), Kim et al. (2007) suggested that firms can minimize the costs created by asymmetric information and misaligned incentives by optimizing jointly over managerial ownership, leverage and dividend payout policies. It is therefore useful to spread knowledge on this topic and to identify systematic tradeoffs in these policies in different environment such the one of Vietnam.

3.1 Sample Selection

A sample consists of 81 firms listed on Ho Chi Minh Stock Exchange (HOSE) over the period 2007–2012 with total 486 observations. This research was conducted using only secondary data, which were collected from different sources such as annual reports and financial statements of these 81 listed firms. All financial firms are excluded. Such as, banks, insurances and investment funds are subject to specific rules and regulations, thus capital structures of these firms are not comparable to the capital structures of firms in non-financial sector.

3.2 Methodology

In a system comprising of independent endogenous variables, the 3SLS method is preferred over the ordinary least squares (OLS) method as the latter would lead to biased and inconsistent parameter estimates. The 3SLS method is the combination of two-stage least squares (2SLS) and Seemingly Unrelated Regression (SUR). This is used in a system of equations which are endogenous (Zellner & Theil, 1962). This is not the case because managerial ownership, leverage and dividends are exogenous to the system. As long as the system of equations is properly identified, 3SLS provides estimates which are more consistent and efficient in the presence of simultaneity bias. Moreover, if the error terms in each regression are heteroskedastically linked, 3SLS will produce more efficient estimates (Greene, 2003). More importantly, the approach adopted in this study is an improvement over the single equation models employed in some studies that examine managerial ownership (Vo & Phan, 2013), debt structure (Titman & Wessels, 1988) and dividend payout policy (Rozeff, 1982). On the other hand, studies by Jensen et al. (1992), Chen and Steiner (1999), Dutta (1999), Kim et al. (2007) employ a simultaneous equations approach with managerial ownership, leverage and dividend policy as the endogenous variables.

Based upon the literature review and previous empirical studies of the interrelationships among the agency-cost-reducing mechanisms, all estimations in this study are undertaken with 3SLS regression method in STATA. While managerial ownership, debt and dividends are defined as dependent variables of each equation, other variables are defined as exogenous variables and taken to be instrumental variables for predicting the endogenous variables.

The specification of the simultaneous equations system is defined by equation (1)–(3) as below:

$$MGO_{i,t} = \alpha_0 + \alpha_1 LEV_{i,t} + \alpha_2 DIVR_{i,t} + \alpha_3 FCF_{i,t} + \alpha_4 GRO_{i,t} + \alpha_5 SIZE_{i,t} + \varepsilon_{i,t} \tag{1}$$

$$LEV_{i,t} = \beta_0 + \beta_1 MGO_{i,t} + \beta_2 DIVR_{i,t} + \beta_3 FCF_{i,t} + \beta_4 LIQ_{i,t} + \beta_5 SIZE_{i,t} + \vartheta_{i,t} \tag{2}$$

$$DIVR_{i,t} = \gamma_0 + \gamma_1 MGO_{i,t} + \gamma_2 LEV_{i,t} + \gamma TANG_{i,t} + \gamma_4 GRO_{i,t} + \gamma_5 ROA_{i,t} + \xi_{i,t} \tag{3}$$

with

- i = 1, 2, ..., 81 and t = 2007, 2008, ..., 2012
- i: number of firms
- t: the estimation period

where: MGO as managerial ownership, LEV as financial leverage, DIVR as dividend payout, FCF as free cash flow, LIQ as liquidity, GRO as sales growth, ROA as profitability; TANG as fixed assets, and SIZE as firm size.

3.3 Measurement of Variables

3.3.1 Equation 1: Managerial Ownership Equation

The explanatory variables for the managerial ownership equation include free cash flow (FCF), sales growth (GRO), and firm size (SIZE).

Easterbrook (1984) and Jensen (1986) emphasized that the substantial free cash flow is the core of agency problems between managers and shareholders. In this case, several empirical researches argued for managerial ownership as evident solution to agency conflicts that aligns interests of managers on those of shareholders. Lange and Sharpe (1995), Himmelberg, Hubbard and Darius (1999) found the positive impact of free cash flow on the proportion of shares held by managers. Based on the argument, a negative coefficient for FCF is hypothesized.

GRO represents sales growth and is anticipated to have a positive impact on managerial ownership. Under asymmetric information, the past sales growth reflects future profitability and potential development. As such, managers would be less reluctant to invest in the firm's equity (Leland & Pyle, 1977). The positive relationship between growth and managerial ownership could stem from informational advantages to insiders about growth prospects of the firm (Bathala et al., 1994). Consequently, a positive coefficient is hypothesized for the GRO variable.

A firm size variable, SIZE, is measured as the natural log of total assets of the firm at the end of the year. Previous studies reported that managerial ownership is significantly greater in smaller firms than in larger firms. As the firm gets larger, managerial risk aversion and constraints on managerial wealth limit the willingness of managers to increase their ownership (Bathala et al., 1984; Crutchley & Hansen, 1989; Jensen et al., 1992). Therefore, a negative coefficient for SIZE is expected.

3.3.2 Equation 2: Leverage Equation

For the leverage equation, the regressor includes free cash flow (FCF), liquidity (LIQ) and firm size (SIZE). Jensen (1986) suggested that in the case of low growth opportunities, the greater agency costs are generated as free cash flow rises; hence, debt financing should be employed. Stluz (1990) also reported a positive relationship between leverage and free cash flow. As such, a positive coefficient is hypothesized for the FCF variable.

Liquidity, LIQ, is calculated as the ratio of current assets over current liabilities. In explaining the LIQ variable, Miller and Rock (1985) argued that firms prefers internal sources (such as available liquidity assets) to leverage. Thus, a firm's liquidity position should have a negative impact on its leverage ratio. Similarly, Myers and Majiluf (1984), Friend and Lang (1988), Kim et al. (2007) reported that firms with highly liquid assets can use such assets to finance their investments. On the ground of these studies, the study hypothesizes that there is a negative relationship between asset liquidity and the leverage.

Theoretically, larger firms are more diversified than smaller ones and less prone to bankruptcy, making them able to accept high debt ratios (Rajan & Zingales, 1995). Another explanation is that majority of large firms in Vietnam are state-controlled firms. Indeed, state-controlled companies seem to access bank loans more easily than other companies. This argument would also suggest a positive coefficient for the SIZE variable.

3.3.3 Equation 3: Dividend Equation

Tangibility (TANG), sales growth (GRO) and profitability (ROA) are included as the explanatory variables in the dividend equation.

The TANG variable is measured as the ratio of the book value of fixed assets to the book value of total assets. Titman and Wessels (1988), Aivazian, Booth and Cleary (2003) suggested that there is a negative relationship between asset tangibility and dividend payout. The more the tangible assets in the firm will lead the lower the size of the short-term assets which may serve as collateral against debt financing. Therefore, firms will depend more on their retained earnings, which means that the lower the chance to pay dividends. This argument would propose a negative coefficient for the TANG variable.

The sales growth, GRO, is found to have negative influence to dividend payout (Jensen et al., 1992). In the view of *Pecking Order Theory,* firm tended to use internal funding sources to finance investment projects. If a firm has large growth opportunities and large investment projects, it chooses to cut or pay lower level of dividends to reduce its dependence on costly external financing. According to *Agency Theory,* firms with slow grow opportunities have high free cash flow, so paying dividends play an incentive role in reducing agency cost of free cash flow (Rozeff, 1982; Jensen, 1986). Consequently, sales growth is expected to be negative related to dividend payout.

The profitability variable, ROA, is defined as the income before tax divided by the book value of total assets. In previous studies, it is considered as an important explanatory variable of dividend policy (Fama & French, 2001). It is argued that there is a positive relationship between the profitability of the firm and dividend payments. *Signaling Theory* supports this relationship. As such, profitable firms are more likely to pay dividends (Miller & Rock, 1985; Jensen et al., 1992). Therefore, a research hypothesizes that there is a positive relationship between profitability and dividend payout.

Concepts and measurements of these variables are summarized in Table 1.

Table 1. Definition and measurement of the variables

Variables	Definition	Measurement
Dependent variables		
MGO	Managerial ownership	Number of shares held by directors and members of the board / total outstanding shares
LEV	Leverage	Book value of total debt/ Book value of total assets
DIVR	Dividend payout	Dividend payout/ Sales
Explanatory variables		
FCF	Free cash flow	[EBIT*(1-tax)+ depreciation – change in working capital – expenditure]/ (total assets)
LIQ	Liquidity	Current assets/ Current liabilities
GRO	Sales growth	$(Sales_t - Sales_{t-1})/ Sales_{t-1}$
ROA	Profitability	Earnings before tax/ Total assets
TANG	Fixed assets	Tangible assets/ Total assets
SIZE	Firm Size	Log(total assets)

4. Empirical Results

4.1 Descriptive Statistics

Table 2 presents the summary statistics of all the variables in the model. First, managers, on average, own approximately 0.2958 (29.58%) of the firms' shares with standard deviation of 0.2314 (23.14%). The mean is considerably higher than the level of managerial ownership in firms listed in U.S market (Jensen et al., 1992; Chen & Steiner, 1999; Dutta, 1999).

Second, the book value of leverage ranges from 0.039 to 0.9111 (from 3.9% to 91.11%) while the mean value is 0.4721 (47.21%). This indicates that some of firms are heavily reliant on debt financing.

Finally, payout ratio has a mean value of 0.0552 (5.52%) with a standard deviation of 0.0828 (8.28%). Minimum and maximum value of dividend payment are respectively 0.00 (0%) and 0.6824 (68.24%).

Table 2. Descriptive statistic of variables

Variables	Number of observations	Mean	Std. Dev.	Minimum	Maximum
MGO	486	0.2958	0.2314	0.0011	0.9615
LEV	486	0.4721	0.2136	0.0390	0.9111
DIVR	486	0.0552	0.0828	0.0000	0.6824
ROA	486	0.1002	0.0975	-0.6473	0.5245
FCF	486	0.0469	0.1430	-0.6570	0.5645
LIQ	486	2.1399	1.4547	0.1638	8.4021
TANG	486	0.1852	0.1693	0.0007	0.9356
GRO	486	0.2066	0.3825	-0.6862	2.9994
SIZE (10^6)	486	1,460,091	2,483,348	94,498	19,697,868

Source: Authors' calculations.

Table 3 reports a correlation matrix between dependent variables and explanatory variables. The outcomes present that most correlations of variables are small, which indicates multicollinearity does not seem to pose a serious problem in the study. Noticeably, none of the correlation coefficients for pair of managerial ownership, leverage and dividends go beyond -0.4 or +0.4. This implies that the interdependence among the three variables does not arise from the spurious correlation.

Table 3. A correlation matrix among variables

	MGO	LEV	DIVR	ROA	FCF	LIQ	TANG	GRO	SIZE
MGO	1								
LEV	0.141	1							
DIVR	0.108	-0.352	1						
ROA	-0.034	-0.589	0.333	1					
FCF	0.135	-0.099	0.060	0.167	1				
LIQ	-0.014	-0.713	0.299	0.440	-0.048	1			
TANG	0.249	-0.030	0.029	-0.074	0.118	0.006	1		
GRO	-0.011	-0.024	-0.023	0.237	-0.021	0.039	-0.050	1	
SIZE	0.345	0.267	0.047	-0.012	0.049	-0.058	0.180	0.002	1

Source: Authors' calculations.

4.2 Regression Results

Table 4 shows the interdependence analysis of managerial ownership, leverage and dividend using the 3SLS estimation.

Table 4. The 3SLS regression results

Explanatory variables	Dependent variables		
	MGO (1)	LEV (2)	DIVR (3)
Constant	-0.8891	-0.8735***	0.0676***
MGO		-0.9097***	0.1459***
LEV	-0.4154		-0.1230***
DIVR	-2.2062	-4.0653***	
FCF	0.2360***	0.2041***	
SIZE	0.2529***	0.3215***	
GRO	0.0079		-0.0082
LIQ		-0.0301**	
ROA			0.1470***
TANG			-0.0564**
No.	486	486	486
R^2	-0.5886	-2.4448	0.1137

Note. *** $p<0.01$; **$p<0.05$; *$p<0.1$.

Source: Authors' calculations.

In some of the 3SLS estimations, R^2 is negative and thus R^2 is not usable in 3SLS as the model in 3SLS focuses more on structural relationship (Gujarati, 2003; Sribney, Wiggins, & Drukker, 2011).

4.2.1 Managerial Ownership Equation

Table 4 (column 1) shows the results of regression analysis between leverage (LEV), dividend (DIVR) and other explanatory variables to managerial ownership (MGO). Both coefficients of the LEV variable and DIVR variable show the negative but insignificant to the MGO variable ($p>0.1$). It shows that the increasing of debt and dividend payment will cause the decreasing of managerial ownership but insignificant. In the context of controlling, it means that the role of managerial ownership could be substitute for leverage and dividend in the mechanism of controlling agency conflicts.

Expectedly, the positive coefficient of free cash flow variable (FCF) is consistent with the hypothesis that the increasing of free cash flow will induce the increase of managerial ownership for controlling agency costs. However, a significant positive effect of firm size variable (SIZE) on MGO indicates that managers tend to increase their ownership when firm size becomes larger. In addition, the coefficient of the grow level variable (GRO) shows the positive relationship with the MGO variable but insignificant (0.0079; $p>0.1$).

4.2.2 Leverage Equation

In the equation with leverage as dependent variable, the relation with managerial ownership and dividend are negative as expected and significant at the level of 1 per cent ($p<0.01$). This result supports the findings of Jensen et al. (1992) which proposed that managers with a major stake in a firm are less diversified and have more incentives to reduce financial risk. Furthermore, this also suggests that there is any substitution relationship between leverage and dividend in mechanism of controlling the agency conflicts.

Expectedly, the exogenous variables in the leverage equation are significant at the 0.01 and 0.5 level. The positive relation between FCF and LEV is supportive of the arguments by Jensen (1986) and Stulz (1990). The negative relation between LIQ and LEV is consistent with arguments of Kim et al. (2007). Lastly, the positive relation between SIZE and LEV is supportive conclusion of Rajan and Zingales (1995).

4.2.3 Dividend Equation

As shown in Table 4 (column 3), the coefficient of LEV variable is negative and significant at the level of 1 per cent (-0.1230; $p<0.01$), which is consistent with the hypothesis H_3 as proposed. Surprisingly, the positive sign on the MGO variable suggests that higher ownership level leads to higher dividend. This result fails to support the second hypothesis that there is a negative relationship of managerial ownership and dividend. Among the three exogenous variables, the TANG variable is negative at the 5 per cent level of significance, the ROA variable is positive and significant at the level of 1 per cent, and the GRO variable is negative but insignificant.

5. Conclusion and Implication

The study investigates the relationship between managerial ownership, leverage and dividend policies. Unlike

previous researches, the 3SLS approach is employed to estimate the system of structural equations. The results suggest that managerial ownership has negative impact on leverage and positive impact on dividend payout. Furthermore, dividend is negatively associated with leverage ratio. Lastly, the study finds that leverage and dividend has a negative relationship. However, the study partially fails to test that there is impact of managerial ownership on leverage and dividend.

The implication of this study are relevant to investors and firms that listed in HOSE. Managers have ownership in firms will suffer from higher risk than investors. One of causes of risk is debt; therefore, managers tend to increase their ownership to take control right affecting financial policies of firms. Especially, managers holding considerable number of shares in a firm will avoid the use of high leverage and even requiring more dividend payment to compensate for their financial risk. As a consequence, small investors are recommended to avoid firms that have high leverage or managerial ownership levels. In term of agency perspective, leverage and dividend policies can be used substitutes as internal mechanisms in reducing agency conflicts. This also implies that the precise policy is required to reduce agency conflicts to improve corporate governance quality in a firm.

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