INTERNATIONAL RESEARCH JOURNAL OF FINANCE AND ECONOMICS

ISSN: 1450-2887

Issue 108
April, 2013

INTERNATIONAL RESEARCH JOURNAL OF FINANCE AND ECONOMICS

http://www.internationalresearchjournaloffinanceandeconomics.com

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International Research Journal of Finance and Economics

Issue 108 April, 2013

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

A Cross-National Comparison of Entrepreneurial Opportunity Recognition: Application of a Self-Organizing Map with a Resource-Based view

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Abstract

Opportunity recognition is an important concept in research on entrepreneurship, and there is now a critical mass of literature to shed light on the concept. Many studies have addressed opportunity discovery and opportunity exploitation; however, very little research has focused on opportunity recognition and whether there are similarities or differences between the determinants of entrepreneurial opportunity recognition across countries. We analyzed Global Entrepreneurship Monitor (GEM) data from the resource-based perspective and applied the artificial intelligence self-organizing map (SOM) approach to fill this research gap. In this study, 45 countries that participated in GEM from 2005 to 2006 were selected for analysis. Our research found that each of the factors studied in this analysis were influential in entrepreneurial opportunity recognition. Furthermore, the factors result in four specific patterns of entrepreneurs. We also examined the stability on the SOM plane of the four patterns of entrepreneurial opportunity recognition. The study reveals interesting patterns of entrepreneurial opportunity recognition in the context of global entrepreneurial activities.

Keywords: Entrepreneurship, Opportunity Recognition, Resource-based View (RBV), Global Entrepreneurship Monitor (GEM), Self-organizing Map (SOM)

1. Introduction

Entrepreneurship has been an important topic of academic research for the past several decades. Since the 1960s, researchers have examined the type of people who become entrepreneurs. By examining the entrepreneurship process, researchers have identified a variety of factors that influence the members of society who engage in entrepreneurial activity and those who do not (Nicolaou & Shane, 2009; Shane, 2003).

Where there are no opportunities, there is no entrepreneurship. If there are no opportunities, the entrepreneurial activities of a potential entrepreneur cannot take place (Short, Ketchen, Shook, &

Ireland, 2009). Jacobides and Winter (2007) described entrepreneurial action as an intentional effort to seize a profit opportunity or an opportunity to create private wealth for the entrepreneur. As entrepreneurial activities have increased around the world, many scholars have developed research to understand the relationship between entrepreneurship and national economic development. It is important for a successful entrepreneur to be able to identify and seize the right opportunities for new businesses (Stevenson, Roberts, Grousbeck, & Liles, 1994). The entrepreneur's task is to discover and exploit opportunities (Hsieh, Nickerson, & Zenger, 2007); the creation of successful businesses follows a successful entrepreneurial opportunity recognition process.

The role that opportunity plays in entrepreneurship has recently received increased scholarly attention. An explanation of the process of opportunity recognition is also a key focus in entrepreneurship research. Many studies have addressed the antecedents of opportunity discovery and opportunity exploitation. Entrepreneurship has been defined as the process of creating or seizing opportunities, but it also involves combining resources and deploying them to create new businesses. Entrepreneurs have individual-specific resources that take advantage of the recognition of new opportunities and the utilization of resources for new businesses (Alvarez & Busenitz, 2001). However, determining what helps entrepreneurs to seize the right opportunities for new businesses is a more difficult issue that requires capability, the deployment of resources, and multiple skills, all combined with entrepreneurial activities.

Although opportunity is the central concept of entrepreneurship research, little agreement exists on the definition and nature of opportunities (Hansen & Shrader, 2006). Short et al. (2009) argued that multiple measures of opportunity should be used to achieve triangulation and enhance confidence regarding the relationship between opportunity and entrepreneurial activities. Much research has been published that discusses the opportunity construct of entrepreneurship through multiple theories, including coherence theory, creation theory, discovery theory, organizational learning, resource-based theory, social cognitive theory, and structuration theory (Short et al., 2009). The research questions on opportunities are fascinating because they are dynamic and difficult to detect and because some people are more successful at the opportunity recognition process than others.

Recently, some scholars have argued that the resource-based view (RBV) is well-positioned to confer new insights into entrepreneurial opportunity recognition (Alvarez & Busenitz, 2001; Ardichvili, Cardozo, & Ray, 2003a; Connor, 2002; Haynie, Shepherd, & McMullen, 2009). Low and MacMillan (1988) noted that "opportunities do not drop from the sky; opportunities come most frequently to people located at advantageous positions within networks; exploiting an opportunity requires certain resources". From the perspective of the resource-based view, resources are defined as the tangible and intangible assets that belong to firms. Although the original RBV focuses on a firm's resources and capabilities to understand how businesses establish and maintain a competitive advantage, Alvarez and Busenitz (2001) extended the boundaries of RBV to include the cognitive ability of individual entrepreneurs. Entrepreneurs have individual resources that facilitate the recognition of new opportunities and the assembling of resources for new businesses. Many studies have found that an entrepreneur's social network contributes to his or her ability to recognize and pursue business opportunities. Resources could also be divided into property-based and knowledge-based resources (Miller & Shamsie, 1996); they can be extended to include technical skills, the ability to innovate, competencies, and managerial capabilities. The RBV of entrepreneurs emphasizes the sustainability of opportunity discovery and exploitation due to resource endowments. It is focused on the extent to which entrepreneurs can secure resources that are rare and difficult to imitate. From the perspective of RBV, social capital functions serve as an important intangible resource for an entrepreneur (Chisholm & Nielsen, 2009).

A number of conceptual efforts have built on entrepreneurial opportunity research to help explain potential catalysts for identifying entrepreneurial opportunities, but most of these ideas have yet to be examined under a global context. For the reasons mentioned above, our study tries to fill an important gap in the existing literature on entrepreneurial opportunity recognition; it focuses on entrepreneurial resources, from opportunity recognition to the ability to utilize resources to build a new

business, and it analyzes issues such as how and why levels of opportunity recognition vary across countries. We will compare the differences in opportunity recognition styles from the resource-based view (RBV) to shed light on the characteristics of opportunities that are the determinants or drivers of converting entrepreneurial opportunity into entrepreneurship.

2. Literature Review

2.1. Entrepreneurial Opportunity Recognition

The role that opportunities play in entrepreneurship has recently received increased attention in research. Recent literature has explored the different perspectives of opportunity (i.e., exploited vs. discovered vs. recognized) for entrepreneurship to shed light on the nature of opportunities (Edelman & Yli-Renko, 2010; Short et al., 2009; Venkataraman, 2000).

Yu (2001) suggested that the recognition of opportunity depends on an entrepreneur's mental construct, which refers to the way people apply knowledge, instead of the knowledge itself. Therefore, we extract experience, opportunity perception, expectation of future market expansion, skills, and education as our variables. Ardichvili, Cardozo, and Ray (2003b) identified entrepreneurs' personality traits, social networks, and prior knowledge as antecedents of the entrepreneurial opportunity identification triad: recognition, development, and evaluation. Entrepreneurs with different types of knowledge learning will perform better in regard to different parts of the opportunity identification and exploitation process (Corbett, 2005).

Carolis and Saparito (2006) identified the interplay between social capital and cognitive biases to explain why some entrepreneurs exploit opportunities while others do not. Baron (2008) also addressed the question of how individuals' affect leads to cognitive entrepreneurial opportunity recognition.

Entrepreneurs within certain technology contexts may be more inclined to discover opportunities (Zahra, 2008). Thakur (1999) performed qualitative research on 50 case studies of Indian entrepreneurs and found that technology substitution or innovation contributed to entrepreneurial opportunities. Opportunities exist when there are technological innovations (Eddleston, Kellermanns, & Sarathy, 2008; Shane, 2001) or new products (Choi & Shepherd, 2004; Shepherd & DeTienne, 2005) that are exploited by entrepreneurs. In the literature discussed above, opportunity perception is a factor that influences entrepreneurship. However, opportunity perception is the ability to receive information about an opportunity, which means there may be the possibility to receive some information about risk as well. Some entrepreneurs who are risk-averse may be less willing to start new businesses when they receive a message about risk (Weber & Milliman, 1997).

The ability to take risks has also recently received increased attention from many scholars (Hmieleski & R. A. Baron, 2008; K. D. Miller, 2007; Mullins & Forlani, 2005). The technological level of new businesses and entrepreneurs' personal traits seem to be other factors in entrepreneurship. Ventures with a high level of technological novelty have proven to be more successful on almost all measures of success in opportunity creation than ventures with a low level of novelty in technology. Moreover, entrepreneurs' personal traits may be the best differentiators between entrepreneurs who are attracted to more risky and uncertain ventures as opposed to entrepreneurs who are more conservative (Dvir, Sadeh, & Malach-Pines, 2010).

2.2. Resource-Based view Toward Entrepreneurial Opportunity

Jay Barney (1991) was considered by most scholars to be the father of the modern resource-based view of the firm. He argued that there can be heterogeneity or resource differences among firms that allow some of them to sustain a competitive advantage. Therefore, the RBV emphasizes the processes of identifying, developing and deploying key resources to maximize the returns of firms. Resources and capabilities form the basis for firms to establish a competitive advantage. According to the RBV, a

competitive advantage often results from the valuable, rare, non-imitable, and non-substitutable resources that a firm owns.

Many scholars have also argued that differences may occur in the form of resources, such as patents, novel technologies, or relationships. Klein (Klein, 2008) argued that entrepreneurial opportunities are formed by subjective judgments that are imagined rather than created or discovered by entrepreneurs, while Zahra (2008) argued that entrepreneurs who are in certain technology contexts may be more inclined to discover opportunities. Choi and Shepherd (2004), from a resource-based view, posited that entrepreneurs who have more knowledge of customer demand for a new product and necessary technologies are more likely to exploit opportunities. Eddleston, Kellermanns, and Sarathy (2008), also from a resource-based view, found that opportunities result from technological innovation and vary across industries. Recently, Haynie, Shepherd, and McMullen (2009) applied the resource-based perspective and found that opportunities are evaluated based on existing resource endowments and an assessment of the future and that entrepreneurs are attracted to opportunities that are complementary to their existing knowledge resources.

From the perspective of the resource-based view, resources are defined as the tangible and intangible assets that belong to firms. Although the original RBV focuses on a firm's resources and capabilities to understand how businesses establish and maintain a competitive advantage, Alvarez and Busenitz (2001) extended the boundaries of the resource-based view to include the cognitive ability of individual entrepreneurs. Entrepreneurs have individual resources that facilitate the recognition of new opportunities and the assembly of resources for new businesses. Many studies have found that an entrepreneur's social network contributes to his or her ability to recognize and pursue business opportunities.

2.3. Social Capital and Entrepreneurial Opportunity

The definition of social capital is controversial. Social capital has been defined as the norms and networks that facilitate collective action (Woolcock, 1998). This concept is somewhat in accordance with Uphoff's (1990) discrimination between "cognitive" and "structural" manifestations of social capital. Social capital refers to the ability of actors to extract benefits from their social structure, networks and memberships (Lin, Ensel, & Vaughn, 1981; Portes, 1998). Social capital is multidimensional and occurs at both the individual and the organizational levels (Nahapiet & Ghoshal, 1998). Social capital has been so widely defined in the literature that a precise link between definition and operationalization is necessary to explain any aspect of the many network processes and reciprocities characterized under this umbrella term (J. N. Baron & Hannan, 1994; Davidsson & Honig, 2003).

Scott (1988), as well as other scholars, followed the concept that social networks consist of weak and strong tie-based social relationships and interactions. For example, people who are part of any "node" in the network may also know others from other networks, which in turn means that networks are interconnected and/or clustered. Depending on a person's relative social-cultural and/or political-economic position, he or she may be part of a few or many networks (Ulhři, 2005).

This means that personal relationships may also play an important role for an entrepreneur (Ulhři, 2005). A strong-tie relationship has been argued to bond actors via mechanisms such as trust, reciprocity and the threat of future censure from exchange (Burt, 1995; Davidsson & Honig, 2003; Schenkel, Hechavarria, & Matthews, 2009).

In addition to weak-tie and strong-tie relationships, social capital literature, according to Kwon and Arenius (2010), has highlighted the roles that both forms of trust can play in reducing the transaction cost associated with searching for information and monitoring possible malfeasance. They suggested that, while specific trust in others may be important at more micro-levels of social capital, the role that general trust plays in perceiving entrepreneurial opportunities is crucial at the national level of analysis for two reasons: (i) the free flow of information between groups; and (ii) the reduction of inter-group conflict and increase of cooperation between groups. First, and most importantly, generalized trust can facilitate the free flow of information across socially disparate groups in a society.

Generalized trust facilitates making casual acquaintances spanning across different social circles, and such casual acquaintances are more likely to provide unique information that leads to an opportunity than are close friends in the same social circle, which is consistent with Granovetter's (1973) argument on the strength of weak-tie relationships. The second reason that the role of generalized trust is crucial in perceiving entrepreneurial opportunities at the national level of analysis is that generalized trust can reduce inter-group conflict and increase cooperation at the societal level by making the proclivity for cooperation portable across disparate social groups. In doing so, generalized trust helps society work together in creating and discovering entrepreneurial opportunities (Kwon & Arenius, 2010).

3. Methodology

3.1. Materials

The data used in this research were extracted from the Global Entrepreneurship Monitor (GEM). The GEM (Reynolds et al., 2005) is an ongoing multinational project that is trying to detect why entrepreneurial activities vary across countries and how entrepreneurial activities affect economic growth. The GEM data are generated by surveys and provide harmonized, international data on entrepreneurial activity, including a number of individual social and economic perceptions. The data used in the analysis originate from the 2005–2006 adult population surveys of the GEM. By pooling the observations of two consecutive years in the GEM data set, we can analyze fluctuations in the distribution of entrepreneurial opportunity recognition across countries and over time. To form the database, each participating nation administered a GEM National Population Survey to a representative sample of adults. These respondents were asked a variety of questions about their entrepreneurship engagement and attitude. This is the key advantage of the GEM, as it would be easier to observe the respondents to differentiate between entrepreneurs and non-entrepreneurs . The GEM database includes various metrics of entrepreneurship, as well as a wide selection of explanatory variables from standardized national statistics (Wennekers, Van Wennekers, Thurik, & Reynolds, 2005).

In this study, 45 countries were selected in our analysis; these countries were participated in GEM through 2005-2006. After screening, our survey database includes the following country samples: Argentina(2005,2006), Australia(2005,2006), Austria(2005), Belgium(2006), Brazil(2005,2006), Canada(2005,2006), Chile(2005,2006), China(2005,2006), Colombia(2006), Croatia(2005,2006), Czech Republic(2006), Denmark(2005,2006), Finland(2005,2006), France(2005,2006), French Polynesia(2006), Germany(2005,2006), Greece(2005,2006), Hungary(2005,2006), Iceland(2005,2006), India(2006), Indonesia(2006), Ireland(2005,2006), Italy(2005,2006), Jamaica(2005,2006), Japan(2005,2006), Latvia(2005,2006), Malaysia(2006), Mexico(2005,2006), Netherlands(2005,2006), New Zealand(2005), Norway(2005,2006), Philippines(2006), Russian Federation(2006), Saudi Arabia(2005,2006), Singapore(2005,2006), Slovenia(2005,2006), Spain(2005,2006), Sweden(2005,2006), Thailand(2005,2006), Turkey(2006), United Arab Emirates(2006), United Kingdom(2005,2006), United States(2005,2006), Uruguay(2006), and Venezuela(2005).

3.1.1. Measurement of Variables

The data on the entrepreneurial activity variables below are taken from the GEM 2005 and 2006 Adult Population Survey. Detailed information on the GEM data collection methodology can be found in the GEM 2005 and 2006 Data Assessment, which is available through the GEM Consortium website at www.gemconsortium.org (Bosma & Harding, 2006; Minniti & Bygrave, 2005). Details on the different variables used in this research are presented in Table 1.

Table 1: Details regarding measurement of variables

Factor Name	Causal Type	Tangible / Intangible	GEM Variable Name	Variable Description
Opportunity recognition	Dep. Variable		OPPORT	Percentage yes on item: In the next 6 months there will be good opportunities for starting a business in the area where you live?
Risk taking	Dep. Variable		FRFAIL	Percentage yes on item: Fear of failure would prevent you from starting a new business?
Total entrepreneurial activity	Dep. Variable		TEA	Total Entrepreneurial Activity [TEA] Index. Number of Adults [18-64 years old] per 100 involved in a nascent firm
Total entrepreneurial activity by opportunity	Dep. Variable		TEAOPP	Total Entrepreneurial Activity [TEA] Index 2006 reporting opportunity as major motive. Number of Adults [18-64 years old] per 100 involved in a nascent firm or young firm or both
Know other entrepreneurs	Ind. Variable	Intangible	KNOENT	Percentage yes on item: You know someone personally who started a business in the past 2 years?
Skill	Ind. Variable	Intangible	SUSKIL	Percentage yes on item: You have the knowledge, skill, and experience required to start a new business?
Desirable career	Ind. Variable	Intangible	NBGOOD	Percentage yes on item : In your country, most people consider starting a new business a desirable career choice?
Status and respect	Ind. Variable	Intangible	NBSTAT	Percentage yes on item : In your country, those successful at starting a new business have a high level of status and respect?
Media effect (knowledge)	Ind. Variable	Intangible	NBMEDI	Percentage yes on item : In your country, you will often see stories in the public media about successful new businesses?
Few competitors (in production)	Ind. Variable	Intangible	TEANPM	Percentage of all TEA business entities reporting some new product/market combination: the product is new to all/most customers and there are no/few competitors
High technology level	Ind. Variable	Tangible	TEATEC	Percentage of all TEA business entities reporting business activity in a technology sector (High or Medium), according to OECD classification
Own new product	Ind. Variable	Tangible	TEACS1	Percentage of all TEA business entities reporting that their product is new to ALL customers
Own unique product	Ind. Variable	Tangible	TEACM3	Percentage of all TEA business entities reporting that NO businesses offer the same product
Own new technology	Ind. Variable	Tangible	TEANT1	Percentage of all TEA business entities reporting that they use the VERY LATEST technology, not available one year ago
High education	Ind. Variable	Tangible	TEAED4	Total Entrepreneurial Activity [TEA] Index 2006. Number of Adults with graduate experience as highest qualification, per 100 involved in a nascent firm or young firm or both (if doing both, still counted as one active person).
High household income (finance)	Ind. Variable	Tangible	TEAHI3	Total Entrepreneurial Activity [TEA] Index 2006. Number of Adults with household income in highest 33 percentile, per 100 involved in a nascent firm or young firm or both (if doing both, still counted as one active person).

Source: Global Entrepreneurship Monitor

3.2. Self-Organizing Map

The Self-Organizing Map (SOM) is one of the most popular neural network models. The SOM quantizes the data space formed by the training data and simultaneously performs a topology-preserving projection of the data onto a 2D weight vectors space for visualization (Vesanto, 2000). Artificial neural network (ANN) has been widely applied to solve various business problems (Smith & Gupta, 2000). Generally, there are two ANN types called supervised and unsupervised learning methods (Haykin & Network, 1999). The main difference between them is that the former learn patterns by using target outcomes, the other need no target outcomes. And the latter is thus most often used for classification tasks. Unsupervised learning is used for exploratory analysis, clustering, and

visualization (Kohonen, 1998). The SOM was originally proposed by Kohonen (Kohonen, 1982), is a neural network algorithm based on unsupervised learning.

Kohonen Self-Organizing Map is a competitive artificial neural network which is structured in two layers (Kohonen, 2001), shown as Figure 1. The SOM consists basically of two layers of so called units or neurons, and the input layer consists of d neurons corresponding to the input vector of dimension d. These units are connected to a second layer of neurons grid. Fig. 1 shows a two dimensional grid as output of SOM. Kohonen's model which is usually bi-dimensional, full connected. There are code vectors (i.e. weight vectors) associated with each neuron or grid on the output layer of the SOM.

3.2.1. Training Algorithm of the SOM

The training process of a self-organizing map can be done in three phases: (i) competitive: each input data sample is presented to all neurons, searching for the best match unit (BMU) using the Euclidean distance measure; (ii) cooperative: a neighborhood relation among the BMU and the other neurons is defined by the function η(i, t); and (iii) adaptive: the BMU and its neighbors' weight vector are updated using an adaptive rule.

The goal of training through a self-organizing map is to cause different parts of the network to respond similarly to certain input data. The training utilizes a competitive learning method. During the training procedure, each input data sample is fed to the network and its Euclidean distance to all weight vectors is computed. The neuron with the weight vector that is most similar to the input data sample is called the best matching unit (BMU). The weights of the BMU and the neurons close to it in the SOM grids are adjusted towards the input space, subscripted here as in b (Eq. (1)):

$$\| \mathbf{D} - \mathbf{Wv_b} \| = \min_i \{ \| \mathbf{D} - \mathbf{Wv_i} \| \} \quad (1)$$

Where D is the input vector; Wvb is the weight vector of the BMU; Wvi is the weight vector of the other neurons; and || || is the distance measure.

After finding the BMU neuron, the weight vectors of the SOM are updated; therefore, the BMU neuron is moved closer to the input vector. This adaptation procedure stretches the BMU neuron and its topological neighbors towards the input vector. The SOM update rule for the weight vector of a unit is shown in Eq. (2).

The magnitude of the change decreases with time and with distance from the BMU. The updated formula for a neuron with weight vector Wv(t) is:

$$\mathbf{Wv}(t + 1) = \mathbf{Wv}(t) + \eta(i, t)\, \alpha(t)(\mathbf{D}(t) - \mathbf{Wv}(t)), \quad (2)$$

Where Wv(t) is the weight vector indicating the output unit's location in the data space at time t; α(t) is a monotonically decreasing learning coefficient at time t; and D(t) is the input vector. The neighborhood functionη (i, t) depends on the lattice distance between the BMU and neuron i. In the simplest form, the neighborhood function is unity for all neurons close enough to the BMU and zero for all others, but a Gaussian function is a common choice.

During mapping, there will be one single winning neuron: the neuron whose weight vector lies closest to the input vector. This can be determined by calculating the Euclidean distance between the input vector and the weight vector.

After the training procedure, the SOM must be evaluated to find out if it has been optimally trained or if further training is required. The SOM quality is usually characterized by the following indices: the quantization error (qe) and the topographic error (te). The quantization error qe is measured by the average distance between each data vector and its BMU. The topological error te is measured by the proportion of all data for which the first and second BMUs are not adjacent, with respect to the measurement of the topology structure (Kohonen, 2001). By training the map with different map sizes, the optimum map size was determined to minimize the quantization error (qe) and topographic error (te).

This study uses the quality of classification to identify the optimal number of the clustering result; this is measured by the Davies-Bouldin index (Milligan & Cooper, 1985). The aim of the SOM method is to approximate the input data space to preserve its topological and metric relationship. The

SOM also uses a neighborhood function to preserve the topological properties of the input space. Therefore, the SOM could act as a data compressor or a feature extractor. It completes the clustering procedure in two modes: training and mapping. The training procedure, which is a competitive process, builds the maps using an input data set. A SOM consists of neurons organized in regular low-dimensional grids. The usual arrangement of neurons is a regular spacing in a hexagonal or rectangular grid. Each neuron is an n-dimensional weight vector, where n is equal to the dimension of the input data set. The neurons are connected to adjacent neurons by a neighborhood relation, which dictates the topology, or structure, of the map.

With automation of the clustering procedure in a SOM (Costa, 1999), higher output dimensions can be used in the discovery of classes in multidimensional data. The Kohonen SOM preserves fewer differences between the intrinsic dimensionality of the input space (data) and the output grid.

The SOM is able to recognize clusters in a data sample where statistical algorithms fail to produce meaningful clusters. The data sample used has general statistical properties such as no correlation and normal distribution. The SOM is a nonlinear projection method that maps high-dimensional data on a two-dimensional grid by keeping the relationships (or topology) in the data but not the real distances (Deboeck & Kohonen, 1998). Generally, the SOM is visualized using a U-matrix (unified distance matrix) of the map, which displays the Euclidean distances between neurons by shades of color (Ultsch, 1993), as shown in Figure 2. The SOM requires very little pre-processing of the data, and unlike most statistical clustering approaches, it is non-parametric.

In our study, we used the SOM toolbox (version 2) for Matlab 2007a developed by the Laboratory of Information and Computer Science at the Helsinki University of Technology (Vesanto, Himberg, Alhoniemi, & Parhankangas, 1999). The SOM has been widely applied in finance, economy, marketing and engineering (Oja, Kaski, & Kohonen, 2003). However, despite its obvious benefits, the SOM has not been applied in GEM analysis tasks.

Figure 1: Structure of a self-organizing map (SOM).

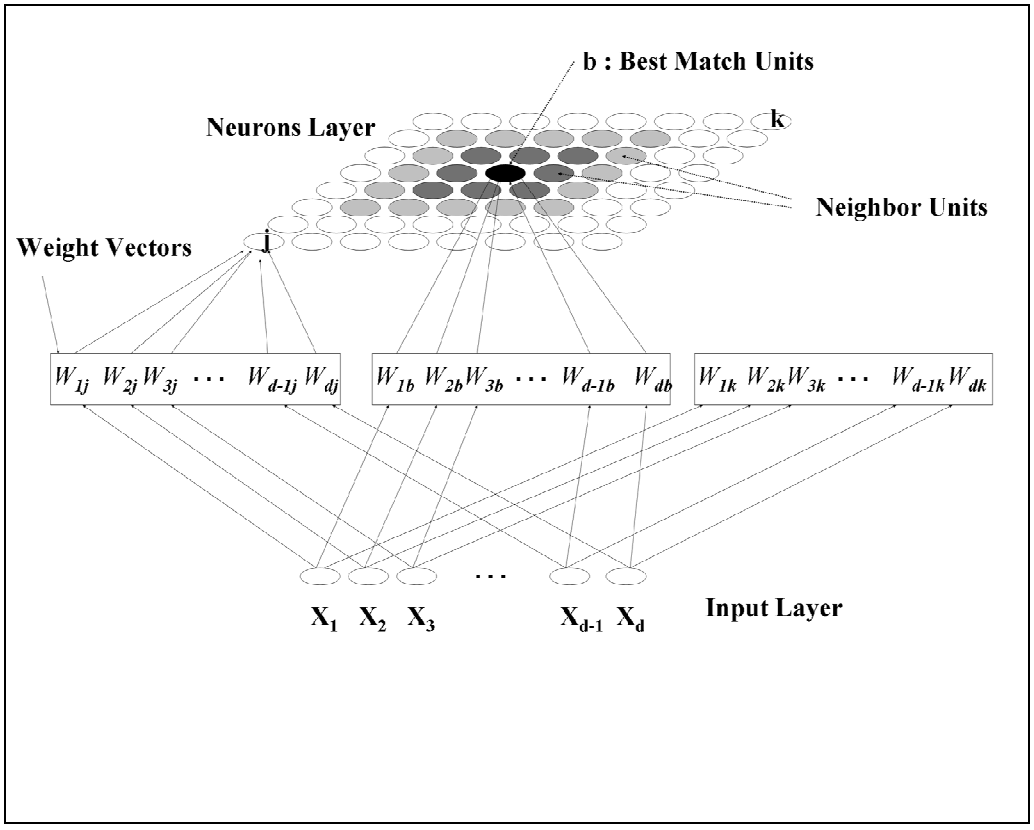
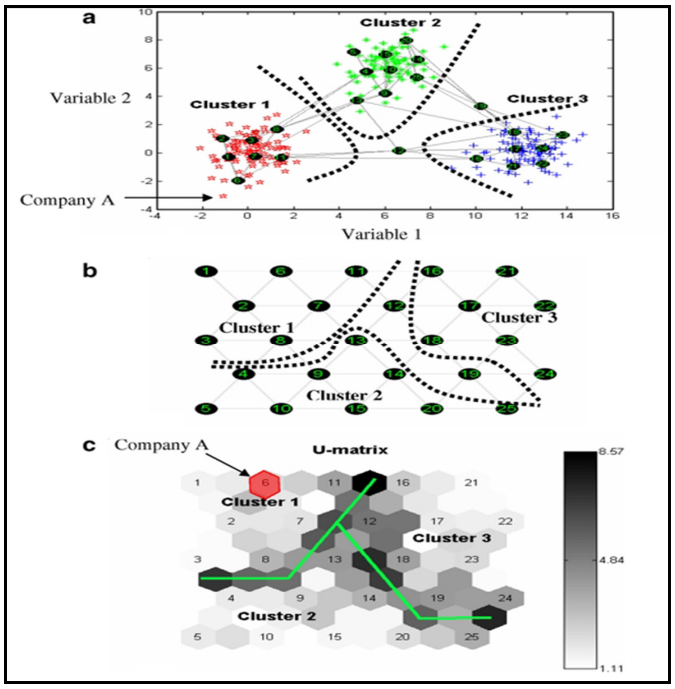
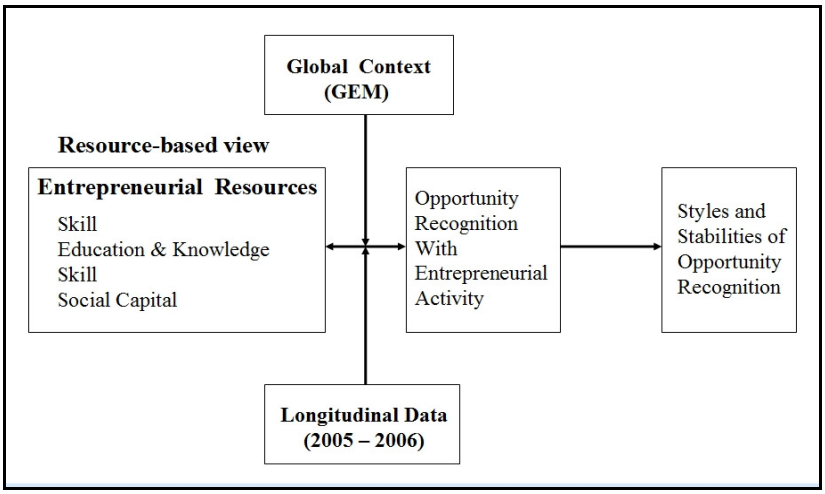


Figure 2: The output of the SOM algorithm and the clustering of data via the U-matrix: (a) The original data set with the prototype vectors (after training); (b) the two-dimensional map grid – neuron space; and (c) the U-matrix, showing the clustering structure of the data set. Source: (Stavrou, Charalambous, & Spiliotis, 2007).



According to the above research stream, and considering the purpose of our research, we diagram the framework of this research as shown in Figure 3.

Figure 3: Research conceptual framework.



4. Results

4.1. Clustering

First, we explored our selected data set to uncover clustering patterns by training a SOM on the whole sample of 45 countries from 2005 to 2006. After training, the SOM consisted of 391 neurons on a 23 by 17 map grid, with a hexagonal lattice and Gaussian neighborhood functions. The grids of the neurons are shown in Figure 4. The resulting U-matrix visualization, which is created for the whole

sample, is shown in Figure 5 and acts as the fundamental graphic display for identifying clusters of entrepreneurial opportunity recognition. High values are represented by darker shades and low values by lighter ones. High values on the U-matrix indicate cluster borders, and uniform areas of low values indicate the clusters themselves. From this figure, we identified four regions – labeled 1, 2, 3 and 4 – which represent different combinations of resources used for opportunity recognition by entrepreneurs across countries.

The U-matrix demonstrates a multidimensional data vector that is estimated for cells on the map. The dimension of the data vectors is equal to the number of variables in the model. After training, each country is placed on the U-matrix to achieve the smallest distance between the estimated vectors and its prototypes on the map (see Figure 5). Because the intermediate hexagons are placed in between the initial hexagons of the D-matrix, the number of cells within the U-matrix is more than that of the D-matrix. In addition, the colors of these additional hexagons are used to estimate the distance between two original neighboring hexagons. For example, the distance of a deep blue intermediate hexagon is much shorter than the distance of a red one. By using the intermediate hexagons, we can determine the clustering memberships of neighboring countries.

Figure 4: Neuron grid map after training.

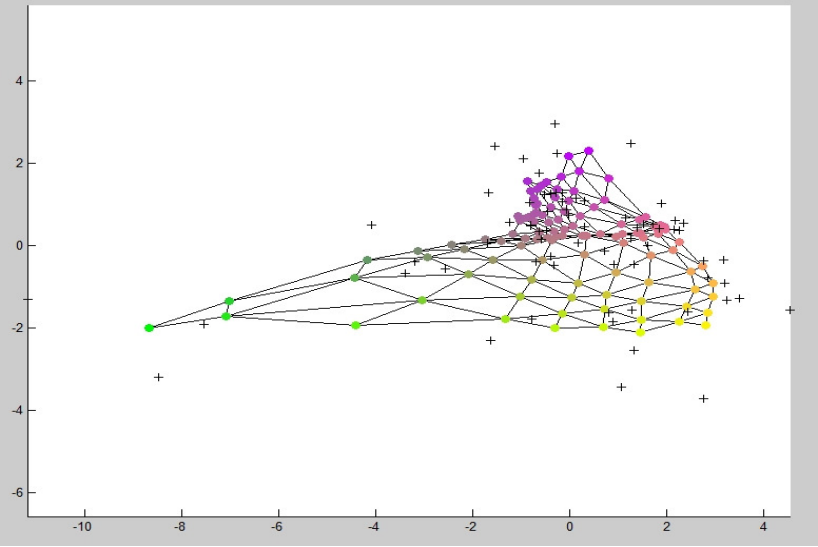
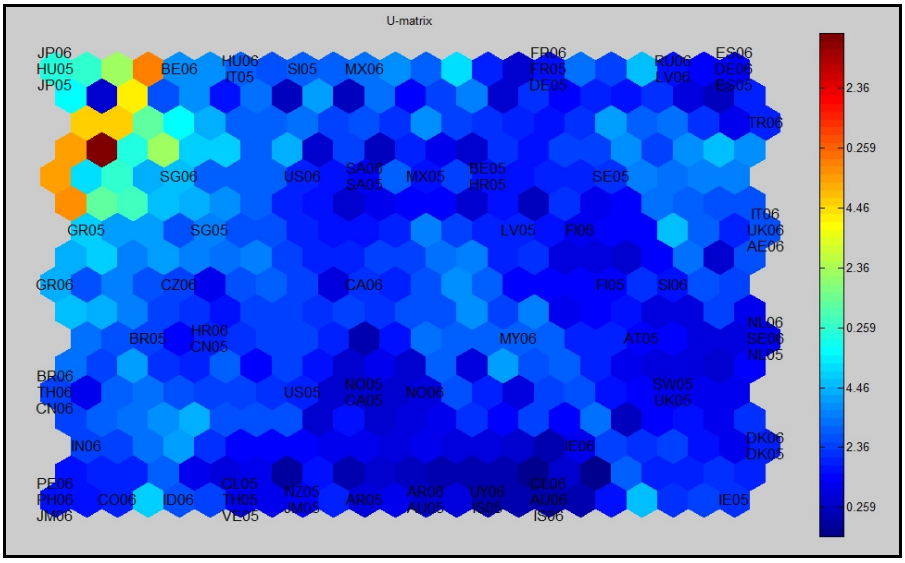


Figure 5: U-matrix.



To make the clustering more accurate, the Davies-Bouldin (D-B) index and K-means clusters are used before the actual clustering. The D-B index is a function to test the variations between clusters. It is also used to evaluate the quality of the K-means clusters. The lower the D-B index, the better the number of clusters. Figure 6 displays the Davies-Bouldin index of each clustering and suggests a number of four clusters. Figure 7 displays a four-cluster K-means cluster partition. According to the suggestion of four clusters and the K-means partition map, Figure 8 displays a clustered U-matrix.

Figure 6: Davies-Bouldin index.

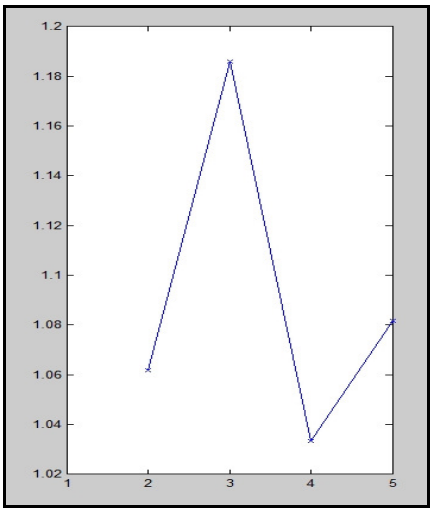


Figure 7: K-means clusters.

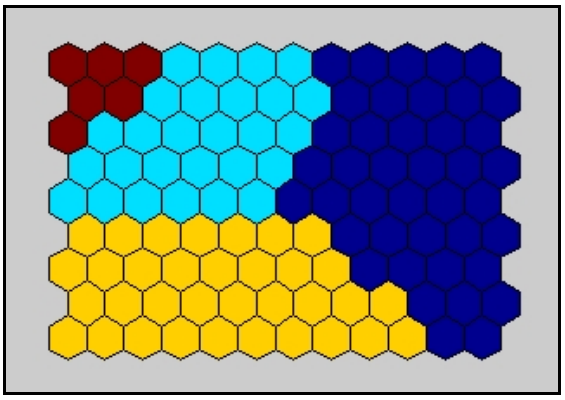
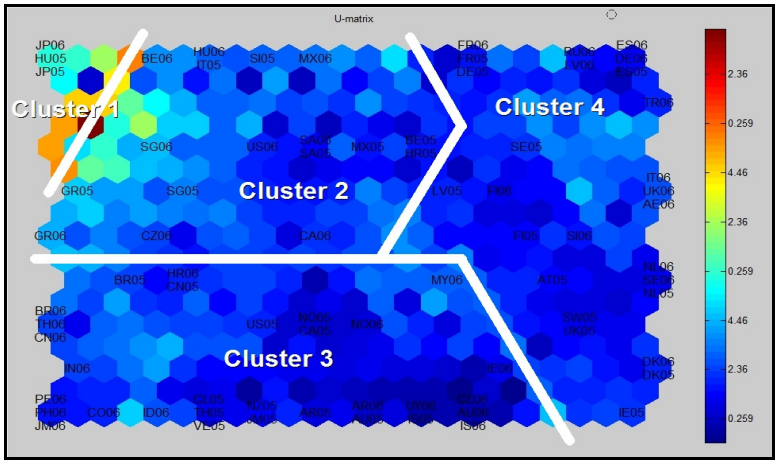


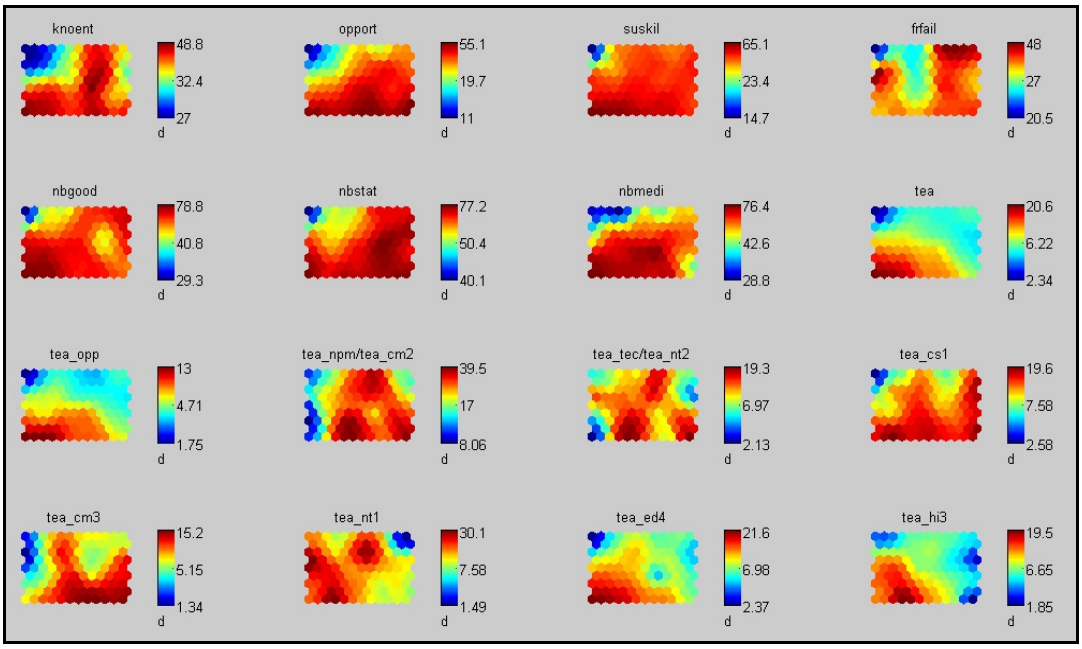
Figure 8: Clustered U-matrix.



4.2. Component Maps

The component maps are shown in Figure 9 and provide a clear visualization of the estimated prototype vectors after training. The maps display the estimated values of the variables at each map position. The estimated values of the variables are displayed in shades of red and blue on the component maps. For example, the opportunity perception component map (i.e., the opport variable map in Figure 9) shows mostly red and dark red on the bottom right and dark blue and light blue on the top left. This is due to the fact that the nascent entrepreneurs in these countries have a higher level of education, have the skills to start new businesses, have new or unique products and technology, and know other entrepreneurs, whereas other entrepreneurs do not have these qualities. The colors change gradually from shades of red to shades of blue, indicating the value shift from high to low, vertically, horizontally or diagonally. Overall, the U-matrix shows the shifting paths of entrepreneurial opportunity recognition across countries and interprets the changing entrepreneurial opportunity recognition style across the map.

Figure 9: Component maps.



4.3. Cluster Analysis

The results of the entrepreneurial opportunity recognition patterns are summarized in Table 2, which shows the countries included and the distinguishing features of each of the clusters.

Table 2: Division of countries into clusters.

Clusters	Countries	Distinguishing Characteristics
Cluster 1 Conservative opportunity recognition	Japan and Hungary	• ***Low*** opportunity recognition, risk taking, and entrepreneurial activities • Knowing fewer entrepreneurs • Weak social support for entrepreneurship • Not using novel technologies • Relatively lower usage of entrepreneurial resources • Relatively lower level of education and knowledge • Lower income or finance support among respondents within its country

Table 2: Division of countries into clusters. - continued

Cluster 2 Tangible-resource opportunity recognition	Belgium, Hungary, Italy, Slovenia, Mexico, Singapore, United States, Saudi Arabia, Croatia, Greece, Czech Republic, Canada	• ***Medium-low*** opportunity recognition, risk taking, and entrepreneurial activities • Knowing fewer entrepreneurs • Medium-low level of social support for entrepreneurship • Using newer products and technologies • Medium-high skills to start new businesses • Medium-low income or finance support among respondents within its country
Cluster 3 Positive opportunity recognition	Argentina, Australia, Brazil, Canada, Chile, China, Colombia, Croatia, French Polynesia, Iceland, India, Indonesia, Ireland, Jamaica, Malaysia, New Zealand, Norway, Philippines, Thailand, United States, Uruguay, Venezuela	• ***High*** opportunity recognition, risk taking, and entrepreneurial activities • Knowing more entrepreneurs • Stronger social support for entrepreneurship • Using novel products and newer technologies • Relatively higher usage of entrepreneurial resources • Relatively higher level of education and knowledge • High income or finance support among respondents within its country
Cluster 4 Courageous opportunity recognition	Austria, Denmark, Finland, France, Germany, Ireland, Italy, Latvia, Netherlands, Russian Federation, Slovenia, Spain, Sweden, Turkey, United Arab Emirates, United Kingdom	• ***Medium-high*** opportunity recognition • Medium-low entrepreneurial activities • High risk-taking abilities • Medium-high level of social support for entrepreneurship • Relatively medium-low level of education and knowledge • Medium-high use of novel products and technologies • Lower income or finance support among respondents within its country

4.4. Opportunity Recognition Stability

From the SOM map of entrepreneurial opportunity recognition, we can observe significant changes on the SOM map given in Figure 10. For example, from 2005 to 2006, Italy moved almost across the entire SOM map. This movement is attributed to a significant change in its entrepreneurial resources of opportunity recognition. However, from the SOM map, we also observe a set of countries that remained in the same or neighboring grid of the map over the study's time period. Most of the countries remained in the same cluster over the study's time period. From the analysis of the resulting SOM map, we found three types of movements on the SOM map. The stability types identified are as follows:

- Good stability: the countries that remain in the same or neighboring grid of the map over the study's time period;
- General stability: the countries that lie in the same cluster on the SOM map over the study's time period; and
- Poor stability: the countries that show significant movement across clusters on the SOM map over the study's time period.

The results of the stability types of opportunity recognition are summarized in Table 3, which shows the countries for each of the opportunity recognition stability types.

Figure 10: Movements on the SOM map.

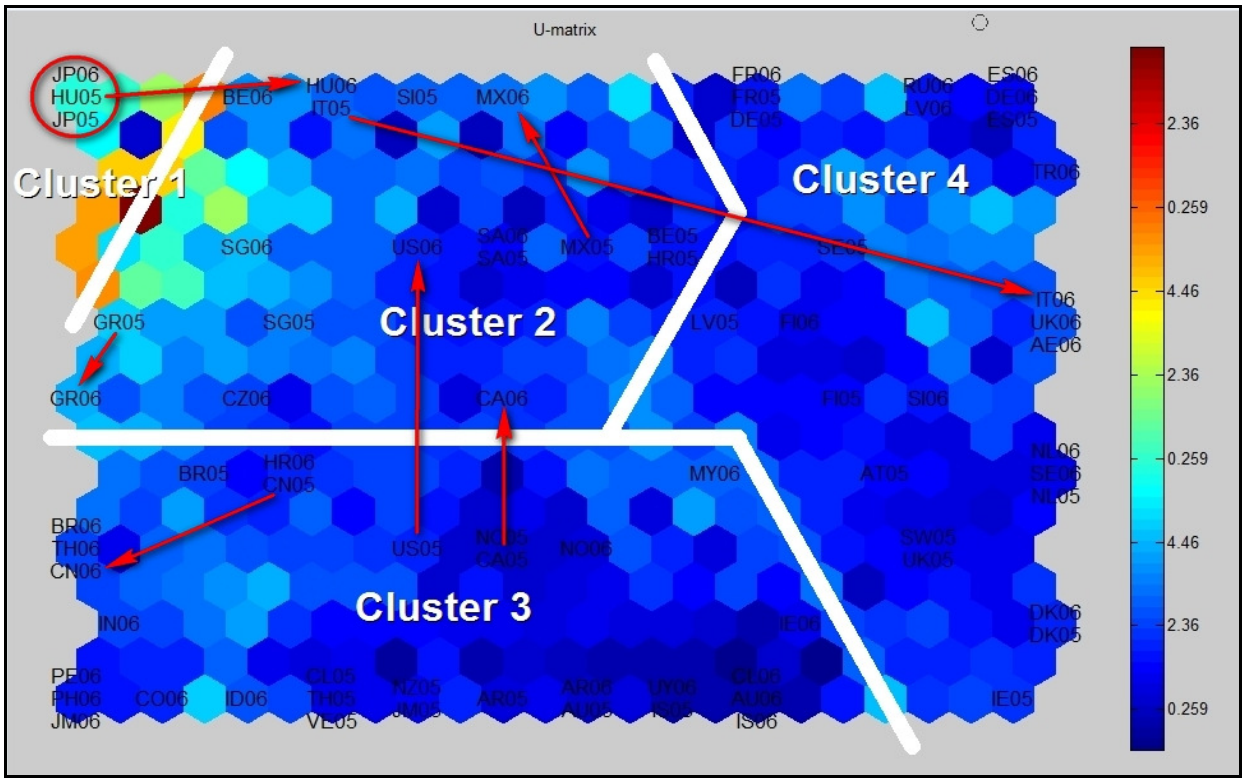


Table 3: The stability of opportunity recognition across countries

Types	Countries
Type 1 Good Stability	Japan(1) *,Saudi Arabia(2),Greece(2),Singapore(2), Norway(3),Argentina(3),Iceland(3),France(4), Spain(4),Netherlands(4),Denmark(4)
Type 2 General Stability	Australia(3),Austria(4),Belgium(2),Brazil(3),Chile(3),China(3), Colombia(3),Czech Republic(2),Finland(4), French Polynesia(3),Germany(4),India(3),Indonesia(3), Jamaica(3),Latvia(4),Malaysia(3),Mexico(2), New Zealand(3),Philippines(3),Russian Federation(4), Sweden(4),Thailand(3),Turkey(4),United Arab Emirates(4), United Kingdom(4),Uruguay(3),Venezuela(3)
Type 3 Poor Stability	Canada(2) — Canada(3), Croatia(2) — Croatia(3), Hungary(1) — Hungary(2), Ireland(3) — Ireland(4), Italy(2) — Italy(4), Slovenia(2) — Slovenia(4), United States(2) — United States(3)

* The number in parentheses denoted the cluster.

5. Conclusions and Implications

5.1. Conclusions

In this research, we used data from GEM for the purpose of distinguishing between different determinants of entrepreneurial opportunity recognition among countries. Using the SOM, we have illustrated patterns of entrepreneurial opportunity recognition. Based on the 16 factors given in Table 1, the resulting clusters displayed four different patterns of entrepreneurial opportunity recognition.

We have obtained several findings in this study. First, we found that each of the factors studied in this research were influential in entrepreneurial opportunity recognition, which further resulted in specific patterns of entrepreneurs. For example, associations with other entrepreneurs, stronger social support of entrepreneurship, the use of novel products and newer technologies, relatively higher usage of entrepreneurial resources, relatively higher levels of education and knowledge, and higher income or financial support among respondents all contribute to cluster 3 (Positive opportunity recognition). Cluster 3 is the best cluster of entrepreneurial opportunity recognition among the four clusters. This means that entrepreneurs with higher entrepreneurial resources may have a reduced anxiety of failure and exhibit entrepreneurial opportunity recognition behavior. From analyzing the component maps (shown in Figure 9) for this cluster, we also found similarities between the component maps of the factors knoent and opport; this demonstrates that the more social capital entrepreneurs have, the more opportunity recognition chances they have. Another interesting example is that cluster 1 (Conservative opportunity recognition) is characterized by fewer associations with entrepreneurs, weak social support of entrepreneurship, lower use of novel technologies, relatively lower usage of entrepreneurial resources, relatively lower levels of education and knowledge, and lower income or financial support among respondents. There were only two countries (Japan and Hungary) included in this cluster. Our research shows that Japan's low entrepreneurial activities lead to Conservative opportunity recognition; this result seems consistent with prior research, as Dominique and Dennis (1990) argued that it is commonly perceived that the cultural environment of Japan restrains entrepreneurship.

Secondly, this study also analyzed the stability of opportunity recognition for each country. It shows that there are three types of stability of opportunity recognition among these countries, including Good stability, General Stability, and Poor Stability. An analysis of the stability of opportunity recognition across countries could help us to understand the persistence of entrepreneurial resources that each country could provide to their entrepreneurs in a global context.

The results of our research have several contributions and implications for academia and entrepreneurs. In the academic arena, our research proposes a new entrepreneurial research methodology for cross-national analysis and identified the determinants of entrepreneurial opportunity recognition from the resource-based (RBV) perspective. From the entrepreneurial perspective, our research gives new insights into the differences and antecedents of entrepreneurial opportunity recognition across nations.

5.2. Implications

The implications of this research are multidimensional. First, the selection of variables and countries provides a good illustration of the determinants of entrepreneurial opportunity recognition. Because previous research has shown strong connections between certain factors, the factor component map and even the countries themselves contribute to the meaningful clusters. This finding implies that entrepreneurship generally involves an entrepreneur's awareness of opportunities, his ability to acquire the resources needed to exploit and discover an opportunity, and his personal ability to combine tangible and intangible entrepreneurial resources into a new firm. Specifically, the factor of knowing other entrepreneurs (i.e., social capital) plays a very important role in explaining entrepreneurial opportunity recognition. This suggests that entrepreneurs should take advantage of their relationships with each other; moreover, the government should create a platform for entrepreneurs to share their entrepreneurial experiences to facilitate entrepreneurial activities in their countries. Governments and institutions within each country should focus on how different public policy approaches create opportunities for entrepreneurs to promote entrepreneurship within their countries.

Second, the self-organizing map has some additional benefits as compared to traditional statistical methods. With the SOM's capability to visualize data, data with different scales can easily be displayed through cluster maps at the same time, which traditional statistical methods cannot easily do. In addition, in this research, the SOM enables us to observe differences between higher and lower entrepreneurial opportunity recognition countries and shows remarkable distinctions.

Finally, this research sheds new light on the question of why the entrepreneurs of some countries are more successful at entrepreneurial opportunity recognition than those of other countries. It also identifies how opportunities at the national level shape the stability of opportunity recognition at the entrepreneur level.

5.3. Further Research and Limitations

Although we were careful to use the GEM analysis to search for possible determinants of entrepreneurial opportunity recognition from the RBV perspective, we may have missed some crucial factors that were not included in the GEM database. In terms of future research, the entrepreneurs' personality, beliefs, values, attitudes, needs, and traits are all potential antecedents to opportunity discovery and exploitation (Shook, Priem, & McGee, 2003) and should be included in further study. Moreover, Short et al. (2009) also suspected that cultural differences may have important implications on the nature of opportunities available and represent a contextual factor. We suggest that further research could include cultural factors to add future insights into the antecedents and consequences of entrepreneurial opportunity recognition behavior. Finally, the data on entrepreneurship used in further research should ideally be available for a sufficiently long period preceding the measurement of the dependent variable. In addition, in analyzing the determinants of entrepreneurial opportunity recognition, time series data on entrepreneurial activity for a large number of countries or longitudinal data on entrepreneurial individuals may shed more light on the factors determining entrepreneurial opportunity recognition.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Modeling the Distribution of Brazilian Stock Returns via Scaled Student-t

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Abstract

Some empirical comparative studies have shown that the Scaled Student's t distribution fits the data better with periodicity less than a month for some alternative distributions found in the literature, for example, logistics, Power Exponencial, the mixture Discrete Normal, etc.. The results of these studies have shown that the degree of freedom in general vary in the practice of 4 to 10. Thus, the Scaled Student's t distribution tends to better adapt to the stylized fact leptocurticidade returns, and besides, this distribution has finite moments of high orders. The results found showed that the the Kullback-Leibler test proves inferior to its competitors because it requires a larger amount of data than the other tests. Applying the methodology presented in this work to the stock returns of the market (Petrobras PN, Ambev PN, PN Telemar and Vale PNA) and IBOVESPA not rejected the hypothesis that returns follow a Pearson IV. Despite the results, and simulations are needed more studies considering other distributions to strengthen the methodology presented in this work. Being that these results can also be applied to other financial data such broaden its usefulness in terms of quantitative modeling in finance. The distribution Scaled Student t proved adequate to model stock returns Brazilian study as the Song's entropy measure. Since the normal distribution and Pearson IV are not capable of efficiently modeling such stocks.

Keywords: Scaled Student t, Statistical Power Test, Normal Distribution, Pearson IV Distribution, Song's Entropy Measure

1. Introduction

The objective of this paper is to propose an algorithm whose statistical tools are able to identify significantly the distribution of the daily rate of return of stocks compounded continuously.

The hypothesis of normality related to stock returns is referenced in several theories and models in finance, for example: the CAPM, which assumes that the distribution of stock returns is elliptical

(Examples: Normal, Student t, etc), the pricing model of Black & Scholes model and portfolio selection (mean-variance).

Until the work of Mandelbrot (1963) admitted that the process leading to variations in share price was a Brownian motion, implying finite variance and normal distribution with mean μ and variance $\sigma^2 t$. Mandelbrot (1963) and Fama (1965) challenged the assumption of normality of returns based on an empirical recurring feature: the excess tails and observations about the mean, with respect to the normal distribution. Thus, they suggest that the pdf of the variations in the price of shares in the class of Stable Pareto distributions with parameter $\alpha \in [0 , 2]$. When $\alpha = 2$, has the normal distribution, and in the case where $\alpha < 2$, the probability distribution has infinite variance, and is leptokurtic (high peak and tails thick). The fact that this model has infinite variance precludes their use in market finance applications.

The Bayesian approach provided by Praetz (1972) deals with the problem of choice of a pdf that represents the variations of the stock price. He assumes that the volatidade term follows an inverted gamma distribution. This distribution is the natural conjugate normal. Thus, if the process is Gaussian distribution and the volatility term range is reversed, then the posterior distribution of the price becomes a Scaled Student's t distribution.

Other authors, such as Aparicio and Estrada (2001), French and Gray (1990), and Blattenberg and Gonedes (1974) and Peiró (1994), performed empirical comparative studies which have shown that in which the Scaled Student's t distribution fits the data better with periodicity less than a month for some alternative distributions found in the literature, for example, logistics, Power Exponencial, the mixture Discrete Normal, etc.. The results of these studies have shown that the degree of freedom in general vary in the practice of 4 to 10. Thus, the Scaled Student's t distribution tends to better adapt to the stylized fact leptocurticidade returns, and besides, this distribution has finite moments of high orders.

Other authors such as Kon (1984) and Simkowitz and Beedles (1980) observed that some daily returns were asymmetrical. The evaluation of asymmetry made by these authors takes into account only the test $\sqrt{b_1}$ (asymmetry coefficient sample). Many studies [Horsewell and Looney (1993), Rayner, Best and Mathews (1995) and Peiró (1999)] showed that the test $\sqrt{b_1}$ does not provide a significant discrimination between symmetric and asymmetric distributions. Premaratne and Bera (2005) warns us that we can not use the test $\sqrt{b_1}$ to assess asymmetry in distributions that have excess kurtosis, for calculating the variance of this test is estimated by disregarding sub-excess kurtosis of returns, and therefore the null hypothesis of symmetry is often rejected.

Kon (1984) and Campbell, Lo and McKinlay (1997, p. 19) suggest that daily rates of returns can also be modeled by a class of discrete mixture of normal. This is because of the possibility of asymmetry in returns.

The discrete pdf of a mixture of two normal can be expressed according to the equation shown below:

$$f(x) = \frac{\delta}{\sqrt{2\pi\sigma_1^2}} \exp\left(\frac{-(x-\mu_1)^2}{2\sigma_1^2}\right) + \frac{1-\delta}{\sqrt{2\pi\sigma_2^2}} \exp\left(\frac{-(x-\mu_2)^2}{2\sigma_2^2}\right). \quad (1.1)$$

When $\mu_1 = \mu_2$, $\sigma_1 = \sigma_2$ and $\delta = 1/2$ the distribution in question is symmetrical.

As Pratt et al. (1996, p. 197-198), the f.d.p. a Student's t distribution is given by the following expression:

$$X \sim t(\theta)$$

$$f(x;\theta) = \frac{\nu^{\frac{\nu}{2}}}{\sigma B\left(\frac{1}{2};\frac{\nu}{2}\right)} \left(\left(\frac{x-\mu}{\sigma}\right)^2 + \nu\right)^{-\frac{\nu+1}{2}} \quad (1.2)$$

$$\theta = \left(\mu;\sigma^2;\nu\right) \in \mathbb{R} \times \mathbb{R}_+^* \times \mathbb{R}_+^*$$

$$x \in \mathbb{R}$$

Where:

$$\mu_0 = \mathbb{E}[X] = \mu$$

$$\mu_2 = \mathbb{V}[X] = \frac{\nu}{\nu-2}\sigma^2,\ \nu > 2$$

$$\mu_3 = \mathbb{S}[X] = 0$$

$$\mu_4 = \mathbb{K}[X] = \frac{3\nu^2}{(\nu-2)(\nu-4)}\sigma^2,\ \nu > 4$$

The Scaled Student's t pdf is given by the expression shown below. The term "Scaled" refers to the fact that the distribution has variance equal to one instead of $\frac{\nu}{\nu-2}\sigma^2$:

$$W \sim t_{pe}(\theta) = t_\nu^e$$

$$f(w,\theta) = \frac{\Gamma(\frac{\nu+1}{2})}{\Gamma(\nu/2)\sqrt{\pi(\nu-2)\sigma^2}} \cdot \left[1 + \frac{(w-\mu)^2}{(\nu-2)\sigma^2}\right]^{-(\frac{\nu+1}{2})} \tag{1.3}$$

$$\theta = (\mu;\sigma^2;\nu) \in \mathbb{R} \times \mathbb{R}_+^* \times \mathbb{R}_+^*$$

$$\nu > 2$$

$$w \in \mathbb{R}$$

Where:

$$\mu_0 = \mathbb{E}[X] = \mu$$

$$\mu_2 = \mathbb{V}[X] = \sigma^2$$

$$\mu_3 = \mathbb{S}[X] = 0$$

$$\mu_4 = \mathbb{K}[X] = (3 + \frac{6}{\nu-4})\sigma^2,\ \nu > 4$$

As Spanos (1999), leptocurtose of a symmetrical pdf can be compared with only one other symmetric fdp having the same variance. Therefore, if we wish to compare the distribution above the normal standardized using the Scaled Student's t distribution Standardized is more appropriate. A pdf of the Scaled Student t standardized is given by the following expression:

$$W \sim t_{pe}(\theta) = t_\nu^e \tag{1.4}$$

$$f(w,\theta) = \frac{\Gamma(\frac{\nu+1}{2})}{\Gamma(\nu/2)\sqrt{\pi(\nu-2)}} \cdot \left[1 + \frac{w^2}{(\nu-2)}\right]^{-(\frac{\nu+1}{2})}$$

$$\theta = (0;1;\nu)$$

$$\nu > 2$$

$$w \in \mathbb{R}$$

Where:

$$\mu_0 = \mathbb{E}[X] = 0$$

$$\mu_2 = \mathbb{V}[X] = 1$$

$$\mu_3 = \mathbb{S}[X] = 0$$

$$\mu_4 = \mathbb{K}[X] = 3 + \frac{6}{\nu-4},\ \nu > 4$$

From what has been stated, we propose the following algorithm to reap the greatest possible number of evidence on which are plausible represent significantly the distribution of returns. First, we

will test the symmetry of stock returns via the RS test proposed by Bera and Premaratne (2005). If the returns are asymmetric, then we use a distribution belonging to the Pearson IV family or a mixture of discrete normal to represent returns.

If returns are symmetric, then we will test the null hypothesis of normality of returns. Occurring a rejection of the null hypothesis, we use a non-parametric entropic measure to identify which Scaled Student's t distribution more plausible for the returns in question [See details in Song (2001)].

It is worth mentioning that this algorithm could be built thanks mainly to test evaluation of symmetry in financial returns made by Premaratne and Bera (2005).

2. Test of Symmetry in Stock Returns

The RS test proposed by Premaratne and Bera (2005) presents the following statistical test assuming a random sample taken from a population belonging to the family of Pearson IV (This takes into account the leptokurtic distribution and the asymmetry in data).

$$RS_{\delta} = \frac{[\sum_{i=1}^{n} \arctan(\frac{\varepsilon_i}{a})]^2}{[\hat{V}_{\delta\delta} - a(\sum_{i=1}^{n} \frac{1}{z_i})^2 (2m \sum_{i=1}^{n} (\frac{2a^2 - z_i}{z^2}))^{-1}]}, \quad RS_{\delta} \sim \chi^2(1). \tag{2.1}$$

Where the values a and m are the estimated parameters of the distribution of Pearson IV.

$\varepsilon_i = y_i - \sum_{i=1}^{n} y_i / n$; $z = a^2 + \varepsilon_i$ and $\hat{V}_{\delta\delta}$ is a measure of the variance of the estimated statistical RS. Below, we show an interesting result in favor of the use of statistics in comparison with the RS test primitive $\sqrt{b_1}$. The values shown in the table below are the number of rejections of the null hypothesis of symmetry.

Table 1: Comparison between RS test and the $\sqrt{b_1}$ test for Scaled Student t with $\nu = 7$.

Distribution t(7)	**RS test**	$\sqrt{\mathbf{b_1}}$
100	0.036	0.4129
200	0.0467	0.4362
300	0.0447	0.4438
400	0.0457	0.4418
500	0.0465	0.4681

From Table 1, we see that the RS test is superior to the $\sqrt{b_1}$ test in order to evaluate leptokurtic distributions.

3. Normality Testes

This step assessment of normality of returns will also be placed in our analysis because there is a great possibility of monthly returns are normally distributed due to the Central Limit Theorem [details at Aparicio and Estrada (2001)]. Therefore, our methodology can be used to monthly returns as for daily returns.

We will use the following statistical tests to assess the normality assumption of a certain stochastic variable: Jarque-Bera Test, entropic test based on mutual information of Kullback-Leibler (KL), entropic test based on Van Es' estimator and the GMM test (Generalized Method of Moments).

Other adherence tests widely used in academia, e. g., Kolmogorov-Smirnov, Shapiro-Wilk, Anderson-Darling and Chi-Squared will not enter into our analysis, therefore, they were less powerful

(when n <50) that our tests as the following works: Jarque and Bera (1980), Vasicek (1976), Van Es (1992) and Arizono and Ohta (1989).

The first entropic test used to evaluate the null hypothesis of normality of a random sample drawn from a given population was formulated in 1975 by Vasicek. Below, we show some important results also supporting the construction of entropic other tests.

The following expression refers to entropy proposed by Shannon in 1948:

$$H(f) = -\int_{-\infty}^{+\infty} f(x) \ln f(x) dx. \tag{3.1}$$

Vasicek (1976) used the results of Rohlin (1961) and Parry (1964) to arrive at the following expression through a change of measurement:

$$H(f) = \int_0^1 \ln\left(\frac{dF^{-1}(p)}{dp}\right) dp \,. \tag{3.2}$$

Considering equation (3.2) above, the estimator is constructed by replacing the F distribution function by the empirical distribution function F_n, and using the difference operator instead of the differential operator. The deriavtive of $F^{-1}(p)$ is then estimated by a statistical function. Assuming that $X_1, X_2, ..., X_n$ is a random sample, the Vasicek estimator is given by:

$$HV_{m,n} = n^{-1} \sum_{i=1}^{n} \ln\left[\frac{n}{2m}\left(X_{(i+m)} - X_{(i-m)}\right)\right]. \tag{3.3}$$

where m is a positive integer, such that $m < n/2$ e $X_{(1)}, X_{(2)}, ..., X_{(n)}$ are the sample values and

$$X_{(i)} = \begin{cases} X_{(1)} & se \quad i < 1 \\ X_{(n)} & se \quad i > n \end{cases}$$

Vasicek (1975) has shown that $HV_{m,n} \xrightarrow{p} H(f)$ with $n \to \infty$, $m \to \infty$ and $m/n \to 0$. It is worth noting that there is no an analytical method of choice for the spacing of Vasicek's test.

3.1. Vasicek's Normality Test

From the entropy estimator of equation (3.3) Vasicek proposes the following test for normality:

$$TV_{m,n} = \frac{\exp\{V_{m,n}(X_1, ..., X_n)\}}{\hat{\sigma}(X_1, ..., X_n)} = \frac{n}{2m\hat{\sigma}}\left[\prod_{i=1}^{n}\left(X_{(i+m)} - X_{(i-m)}\right)\right]^{\frac{1}{n}} \tag{3.4}$$

where $\hat{\sigma} = \hat{\sigma}(X_1, ..., X_n) = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(X_i - X)^2}$ is a maximum likelihood estimator of σ under the null hypothesis of normality.

3.2. Normality Teste Using Van Es' Estimator

This test was proposed in 1992 by Van Es is the entropy estimator is given by:

$$E_{m,n} = \frac{1}{n-m}\sum_{i=1}^{n-m} \ln\left(\frac{n+1}{m}\left(X_{(i+m)} - X_{(i)}\right)\right) + \sum_{k=m}^{n}\frac{1}{k} + \ln m - \ln(n+1).$$

And the statistic test based on $E_{m,n}$ is given by:

$$TE_{m,n} = \frac{\exp\{E_{m,n}(X_1, ..., X_n)\}}{\hat{\sigma}(X_1, ..., X_n)}$$

$$= \frac{1}{\hat{\sigma}}\exp\left\{\sum_{k=m}^{n}\frac{1}{k}\right\}\left[\prod_{i=1}^{n-m}\left(X_{(i+m)} - X_{(i)}\right)\right]^{\frac{1}{n-m}}. \tag{3.5}$$

The results obtained by Esteban et al. (2001) show that among some competing entropic estimators [Vasicek (1975), Correa (1995), and Wieczorkowski and Grzegorzewski (1999)], the entropic estimator of Van Es' is most useful when the data sample to be tested and are leptokurtic and symmetric. Therefore, the estimator of Van Es' is the most suitable for testing the hypothesis of normality in stock returns compared with its competitors entropic.

3.3. Normality Teste Using Kullback-Leibler Mutual Information

Song (2002) proposes a test of grip Entropic mutual information based on Kullback-Leibler covering all parametric families of probability distributions encountered in statistics. Therefore, it is possible to directly test any type of probability distribution. The mutual information of Kullback-Leibler between two distribution functions is given by:

$$I(F,F_o;\theta)=\int_{-\infty}^{+\infty} f(x)\log(f(x)/f_o(x,\theta))dx\,, \tag{3.6}$$

with null hypothesis

$H_o : F(x)=F_o(x;\theta)$.

When the null hypothesis is satisfied, we have $I(F,F_o;\theta)=0$. Changing the equation (3.6), we obtain the equation (3.7).

$$I(F,F_o;\theta)=-H(f)-\int_{-\infty}^{+\infty}\log f_o(x;\theta)dF(x)\ , \tag{3.7}$$

where $H(f)$ is given by equation (2.1).

Song (2002) proposes the following statistic test:

$$I_{mn}=-H_{mn}-\frac{1}{n}\sum_{i=1}^{n}\log f_o(X_i;\hat{\theta}_n)\,, \tag{3.8}$$

where $\hat{\theta}_n$ is the vector containing the parameters obtained by maximum likelihood of the pdf f_o (under the null hypothesis). The expression H_{mn} is derived from equation (3.3).

Song (2002) proposes the following test statistic under the particular null hypothesis of normality. Equation (3.8) results in the expression given below:

$$I_{mn}=\log\frac{(2\pi e)^{1/2}}{TV_{mn}}\ , \tag{3.9}$$

where TV_{mn} is calculated based on equation (3.4).

Under the null hypothesis of normality, the Vasicek's statistic TV_{mn} tend to $\sqrt{2\pi e}$, and therefore, the statistic I_{mn} tends to zero.

Song (2002, p. 1114) proposes an analytical method of choice for testing the spacing based on mutual information entropy of Kullback-Leibler. This method can be understood by the algorithm stated below:

$$\hat{m}:=\min\{m^*:m^*\arg\max_m\{H_{mn}:H_{mn}\le-\frac{1}{n}\sum_{i=1}^{n}\log f_o(X_i;\hat{\theta}_n)\}\}. \tag{3.10}$$

3.4. Jarque-Bera Test (Naive)

Jarque and Bera (1980) proposed the following statistical test to evaluate the hypothesis of normality of a random sample. Being $\{X_i\}_{i=1}^{n}$ a random sample in which the stochastic variable is normally distributed with mean zero and variance σ^2, we have:

$$\frac{1}{6}\left(\frac{1}{\sqrt{T}}\sum_{i=1}^{T}(x_i/\hat{\sigma})^3\right)^2+\frac{1}{24}\left(\frac{1}{\sqrt{T}}\sum_{i=1}^{T}[(x_i/\hat{\sigma})^4-3]\right)^2\overset{n\to+\infty}{\to}\chi^2(2)\,. \tag{3.11}$$

where $\hat{\sigma}$ is the maximum likelihood estimator of populational σ under the null hypothesis of normality.

3.5. Normality Test (Naive) Considering the GMM Approach (Generalized Method of Moments)

Considering a sample $x_i,.....x_n$ of a certain variable of interest denoted by *X*. The observations can be independent or dependent. It is assumed that the marginal distribution of X is $N(0,1)$.

In the case of this work, assume that the observations are (iid). Therefore, this statistical test is summarize in the following expression:

$$\sum_{i=3}^{p}\left(\frac{1}{\sqrt{T}}\sum_{t=1}^{T}H_i(x_t)\right)^2 \sim \chi^2(p-2). \tag{3.12}$$

where H_i is the Hermite polynomial of order *i*, and being $H_o(x)=1$, $H_1(x)=x$, then $H_i(x)=\frac{1}{\sqrt{i}}\left\{xH_{i-1}(x)-\sqrt{i-1}H_{i-2}(x)\right\}, \forall i>1$.

These polynomials have the property of being orthogonal and presents variance equal to one.

Bontemps and Meddahi (2005) showed that the isolated use of the Hermite polynomial of order 4 shown equal or superior to the Jarque-Bera test in terms of test power.

3.6. Comparisons of Normality Tests

From what has been stated above, we consider the following statistical tests to evaluate the normality assumption of a particular stochastic variable: entropic test of Van Es (TE_{mn}), entropic test based on the mutual information of Kullback-Leibler (I_{mn}), Jarque-Bera test (T_{JB}) and GMM test (T_{GMM}).

In all analyzes were simulated 10,000 random samples from a Scaled Student's t distribution for the calculations concerning the power of the tests.

There are two main reasons in which we use the Scaled Student's t distribution in order to accomplish the comparisons of the power of normality tests studied in this article:

- The Scaled Student's t distribution tends to normal when $\nu \to +\infty$. Thus, we can compare the power of normality tests by considering the number of rejections of the null hypothesis of normality when ν grows . This approach was also used by Bontemps and Meddahi (2005);
- Both theoretically and empirically, the Scaled Student's t distribution tends to better represent the daily returns of stocks.

Thus, it is interesting to show what is the sample size (discriminatory) for which the power of the tests are equal to 80% (benchmark). Thus, using samples with *n* greater than or equal to discriminating *n* the conclusions of the tests are more reliable. Remember that the power of a statistical test is calculated based on the number of rejections observed under some conditions in the alternative hypothesis.

Regarding the Van Es entropic test, we found through our simulations that a *m* equal to $n/2-1$ provides good power to the test when we are dealing with symmetric and leptokurtic distributions. The charts below show the evolution of the power of the test relative to the spacing *m*.

Figure 1: Evolution of test power for $n = 20$.

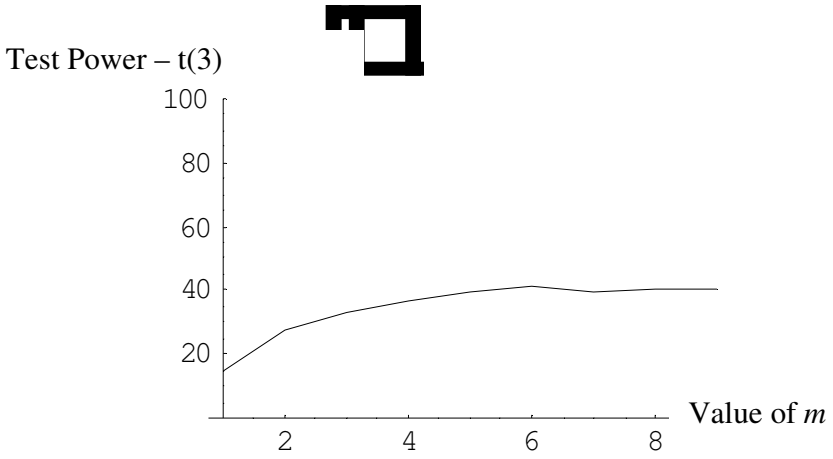
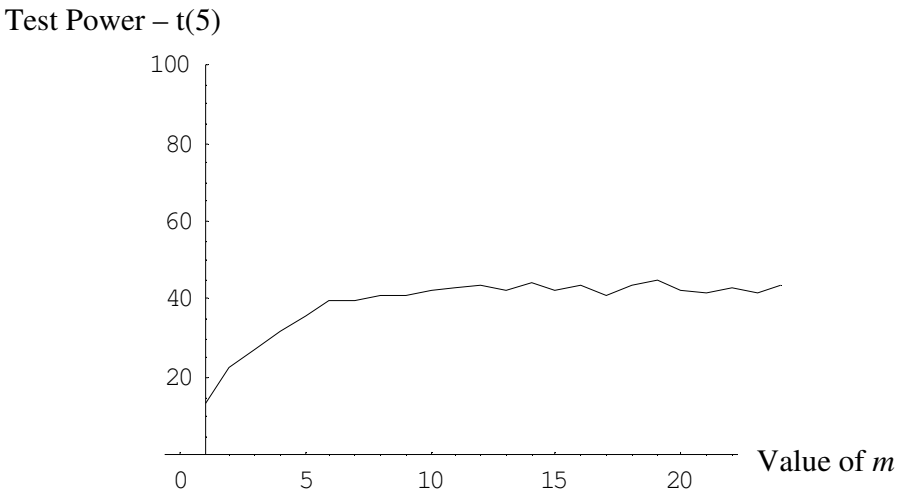


Figure 2: Evolution of test power for $n = 50$.



The following table shows the main results.

Table 2: Values of discriminatory *n* tests of Normality.

Discriminatory n	**Van Es**	**Jarque Bera**	**GMM**	**KL**
t(4)	81.43 (n = 100)	81.65 (n = 120)	80.38 (n = 130)	81.15 (n = 185)
t(5)	80.04 (n = 170)	80.13 (n = 180)	80.60 (n = 195)	80.87 (n = 215)
t(10)	80.65 (n = 580)	80.72 (n = 590)	80.46 (n = 575)	80.57 (n = 760)

From the table above, we find that only the Kullback-Leibler test proves inferior to its competitors because it requires a larger amount of data than the other tests. Generally, for samples above 600, the test Van Es, JB and GMM proved more reliable evaluation of the normality of the distributions generated by simulation. Since the Kullback-Leibler test proves efficient for samples above 760 observations.

4. Intrinsic Measure of the Format of a Distribution (ζ_f)

Song (2001) developed a non-parametric entropic statistic (ζ_f) which serves as a measure of the format of a probability distribution. Serving as a measure of a distribution format, ζ_f can be used to

compare formats tails and various distributions in which the traditional measure of kurtosis is not applicable, for example, the Student t (with $\nu < 4$), the Cauchy, the Lévy, etc. Moreover, the traditional measure of kurtosis is only for symmetric distributions.

A Rényi information of order λ for a continuous random variable with pdf $f(x)$ is defined as the following expression:

$$\zeta_R(\lambda) := (1-\lambda)^{-1} \log(\int f^{\lambda}(x)dx) \text{ for } \lambda \neq 1 \text{ and } \zeta_R(1) := \lim_{\lambda \to 1} \zeta_R(\lambda) = H(f). \quad (4.1)$$

Song (2001) showed using the expression (4.1) the following result:

$$\dot{\zeta}_R(1) = -\frac{1}{2} \text{var}(\log(f(X))). \quad (4.2)$$

Thus, if the entropy $H(f)$ measures whether a particular pdf is concentrated or dispersed, then the variance of log-likelihood $\zeta_f := -2\dot{\zeta}_R(1)$ measuring the intrinsic shape of a distribution [See details in Song (2001)].

Song (2001) estimated the measure ζ_f for Student's t distribution. It is worth mentioning that as much at Scaled Student t as Student t have the same measure ζ_f, indicating that for the same values of ν the two distributions have the same weight tails.

For the Scaled Student's t distribution the measure ζ_f is equal to:

$$\zeta(\nu) = \frac{1}{4}(\nu+1)^2 \left\{ \dot{\psi}(\frac{\nu}{2}) - \dot{\psi}(\frac{\nu+1}{2}) \right\}. \quad (4.3)$$

It is worth mentioning that for the Normal distribution the measure ζ_f is always equal to 0,5. Therefore, distributions that present measures ζ_f larger than 0.5 will be leptokurtic; distributions with measures ζ_f equals to 0.5 will be mesokurtic and distributions with measures less than 0.5 will be platykurtic .

Song (2001) proposes a non-parametric approach to estimate the measure ζ_f from a sequence of independent observations. Below we show the necessary procedures to estimate the measure $\hat{\zeta}_f$.

$$\hat{\zeta}_f = \hat{\Delta}_2 - \hat{\Delta}_1^2 \text{ and } \hat{\Delta}_i = \int f_n(x) \log^i f_n(x)dx \quad i = 1,2. \quad (4.4)$$

The function $f_n(x)$ is the nonparametric kernel density estimator:

$$f_n(x) = n^{-1} \sum_{i=1}^{n} \frac{1}{b_n} K\left(\frac{x - X_i}{b_n} \right). \quad (4.5)$$

The function used is a Gaussian kernel, and the parameter b_n may be calculated using the following equation proposed by Dias (2002, p. 142):

$$b_n = 1,06 \cdot \hat{\sigma} \cdot n^{-1/5}, \quad (4.6)$$

where $\hat{\sigma}$ is the sample standard deviation and *n* is the sample size.

Thus, from the measurement $\hat{\zeta}_f$ we can estimate the degrees of freedom of the Student's t distribution that supposedly fits better to the sequence of observations.

The complementary application of a chi-square test may be useful in order of testing whether the distribution with ν estimated by the measure $\hat{\zeta}_f$ adheres significantly to stock returns.

5. Results

We will use the following daily stock returns (of companies in the brazilian financial market.) in order to apply the proposed methodology: IBOVESPA, Petrobrás PN, Ambev PN, Telemar PN e Vale PNA. The Bovespa Index (IBOVESPA) is the most important indicator of average stock prices traded on the Bolsa de Valores de São Paulo in Brazil (Bergmann et al., 2011). The period varies from 11/3/99 to

11/29/2004 totaling 1200 observations. The results concerning the symmetry test are shown in the table below.

Table 3: P-values of RS test of the returns to be analyzed.

Returns	p-value of RS test
IBOVESPA	0.249
Petrobrás PN	0.144
Ambev PN	0.260
Telemar PN	0.842
Vale PNA	0.0023

From the table above, only the distribution of returns of Vale PNA is asymmetric at 5%. So below, we test the hypothesis of normality for the remaining returns, and will model the distribution of returns to Vale PNA by a Pearson IV. Its parameters are estimated by the maximum likelihood method (ML).

The results of normality tests are shown below.

Table 4: Normality test results.

Returns	Van Es	JB	GMM	KL
IBOVESPA	0.00	0.00	0.00	0.001
Petrobrás PN	0.00	0.00	0.00	0.007
Ambev PN	0.00	0.00	0.00	0.005
Telemar PN	0.00	0.00	0.00	0.002
Vale PNA	0.00	0.00	0.00	0.007

From the results above, we reject the hypothesis of normality for all returns at 5%. Below, we show the values ν of the Scaled Student t distributions by the entropic measure $\hat{\zeta}_f$ accompanied by the p-values (chi-square test) to verify adherence to these distributions estimated to their respective returns.

Table 5: Values of ν and p-values of the chi-square test.

Returns	$\nu(\hat{\zeta}_f)$	p - value(χ^2)
IBOVESPA	3.77	0.264
Petrobrás PN	3.903	0.368
Ambev PN	3.92	0.284
Telemar PN	5.49	0.487
Vale PNA	-	-

Regarding the distribution of returns of Vale PNA, the parameters estimated by ML are: $m = 2.217;\ \delta = -0.052;\ a = 0.037.$ The measure of Song was not able to measure the degrees of freedom of the distribution Scaled Student t referring to the returns of Vale PN. The p-value of chi-square is equal to 0.587, and therefore in the level of 5%, we can say that we can not reject the hypothesis that returns follow a Pearson IV with its parameters estimated above.

6. Final Considerations

This work can be seen that the simulations performed on Scaled Student's t distribution fit the data better returns for compounds that exhibit leptocurticidade. This study supports the result of the test $\sqrt{b_1}$ (coefficient of assimetral sample) is not the most suitable for the evaluation of asymmetry of the data. The results found showed that the the Kullback-Leibler test proves inferior to its competitors because it requires a larger amount of data than the other tests. Applying the methodology presented in

this work to the stock returns of the market (Petrobras PN, Ambev PN, PN Telemar and Vale PNA) and IBOVESPA not rejected the hypothesis that returns follow a Pearson IV. Despite the results, and simulations are needed more studies considering other distributions to strengthen the methodology presented in this work. Being that these results can also be applied to other financial data such broaden its usefulness in terms of quantitative modeling in finance. The distribution Scaled Student t proved adequate to model stock returns Brazilian study as the Song's entropy measure. Since the normal distribution and Pearson IV are not capable of efficiently modeling such stocks.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Examination of Privatization Results with Ratio Analysis: A Turkey Example (Afyon Cement Plant Application)

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Abstract

Privatization is carried out in order to increase the efficiency of public institutions and help the government to perform its fundamental duties. It is thought that privatized institutions increase their profits and efficiency following the privatization. Studied Afyon Cement INC. was privatized in 1989. Liqudity, profitability and leverage ratios of company before and after privatization were analyzed with this study and it was tried to put forward how the company was affected from privatization.

Introduction

Cement sector accelerated its development towards the end of XIXth century. The need for cement industry came into prominence more due to the development of construction production techniques and variation of construction material. This need was met with cement import because there weren't cement plants in Turkey. The first cement plant "Linardos" was established in 1906 due to the reasons of increase in cement need, opportunities by Law for Encouragement of Industry and such conveniences as free field, tax and customs exemption (Ekiz, 2008). Cement sector realized its historic development between 1929-1939. The most imporant progress within this development process is the application of industralization policy in 1932. Protection in foreign trade was increased, it was paved the way for development in public sector. The reason for this is that private sector's investment came to a standstill because of the Great Depression in 1929 (Kahraman, 2005). Cement sector developed fast with private sector's entering into cement sector more profoundly after 1950 and establishment of ÇİSAN and its production volume increased (Korkut, 2008). However the need for import continued in the market, only in 1960s Turkey came to a place to be able to export cement in low levels (Akçaylı, 2003). Because the domestic demand which increased rapidly between the years of 1963 and 1970 couldn't be met with in-country production, the necessity for continuing import emerged (Ekiz, 2008).

Turkey's being a real exporter in cement sector was possible after the year 1970 (SPO 8th five year Progress Plan). Economic crisis emerged all over the world and in Turkey between 1978-1983 was seen to drag the construction sector into the crisis (Çetin, 2011). Cement grinding capacity was 68 million tone and clinker production capacity was 39 million tone in 2005 (SPO 9th Progress Report). When evaluated in terms of production and consumption by years, it is seen that the produced cement only meets domestic need and there is a capacity increase in the sector as of the year 2004. The reason for is that economic situation in the country started to recover relatively after the crises of 2000 and 2001 and construction sector got into action and expectation for future investment in cement sector increased. Cement sector was in decline as production and capacity in years of 1999 and 2003; capacity usage rates had a tendency to increase both in cement and clinker production as of the year 2004 (SPO 9th Progress Report). The privatization of plants in cement sector was completed with the selling of

Ergani and Kurtalan. Following the privatization, cement production capacity was 65 million tone and annual average cement production was 35 million tone in 2003. It was seen that 9.846.117 tones of total production was met by privatized companies. The concept of privatization became an issue as a first time in the world with Conservative Party's coming to power in 1979 in England (İleri, 1998). The concept of privatization is partial or complete selling of businesses whose property belongs to public to the private individuals or institutions, with its basic meaning (Kök, Kara; 2011). In the broad meaning, while the privatization is "All practices regarding minimizing or completely removing the efficiency of government activities within domestic economy" (DPA, 2004), it can be defined from another point as below: privatization is the transfer of public institutions, which are inefficient and lost its efficiency in 1980s, to private sector whose efficiency and productivity is higher (Yazıcı, 1997). When privatization appeared in the beginning of 1980s, especially liberal right parties adopted the privatization as a primary policiy and started to put into practice (Çelebi, 1996). While privatization is seen as one of the means to decrease public sector deficit for developed countries and to increase efficiency and competition, it is introduced as a tool to accelerate the growth, to decrease public sector deficits and to remove structural inequalities in underdeveloped and developing countries. It became one of the main factors of Reagen's economic policies in the USA and Teatcher's economc policies in Wngland (Tes-İş Journal, 2009). International finance institutions such as IMF and World Bank started to issue credit to developing countries in 1970s. The risk for these credits not to come back with their capital and interests as of the beginning of 1980s, and struggles for searching real sources for increasing international fund surplus caused privatization practices to be brought to international platform (Kök, Kara; 2011).

Samples and Implementations of Privatisation in Developed World Countries

America: Privatization took general and local place in the country having the most developed economy. Politicians were forced to make public sub-investments and services done by private sector for the problems caused by the decrease in budget funds and increase in taxes. Privatization of federal level began in 1982 February with Federal Property Review Board established by President Reagan. A large part of public services were privatized in the USA. Municipal services, life-guard services, prison services, garbage collection services, fire services especially are largely carried out by private sector. So, due to the full-scale privatizations in local administrations, the number of civil servants in towns with 40.000 population decreased to 55 on average (Sarısu, 2003).

England: This continous downward trend which is seen as of the year 1965 in the profitability of public sector businesses was in tendency to accelerating as of the beginning of 1970s and this constituted the beginning of developments in privatization. When the Conservative Party came into power, they did more than they promised before the election. The large part of big companies held by public sector were assigned to private sector. As of the beginning of 1991, more than half of public sector were privatized, 650 thousands of workers changed sector , 1 million 250 thousands of municipiality houses were sold and 9 million people possessed the share of privatized comapnies. In 1993, railways, coal directorates and postal services were privatized as a last round of privatization. Following the privatizations, 75 billian dollar privatization income were provided only in presidency of Margaret Thatcher (Akdiş, 1994).

Germany: Privatization was firstly started in Western Germany in 1957 and successful privatization examples were given. The main purpose of privatization in Western Germany was to develop social market economy and to find a solution for inequality in distribution of income to some extent. Within the framework of these principles, Preussap which is an incorporation operating in mining sector was firstly privatized. During the putting of shares on market, a restriction regarding selling 5 shares to a person at most was brought and this provided that shares were bought by many people. Thus, a successful privatization practice was realized by being sold shares amounting 100.058.000 DM to 26.119 people. After Western Germany united with Eastern Germany, they carried out privatization matter bilaterally. While the shares allocated for private sector are increasing in

classical German institutions of Western, for example in Luftansa, or same developments are happening in Weba group; governmental initiatives of Eastern Germany are opening up to the western world. Germany planned to make 10 billion DM privatization as of the year 1990. Besides, they bought shares that are effective in management of Volkswagen being a KIT, Seat in Spain and Skoda in Czechoslovakia. This brought a multinational privatization type (Karagöz, 2009).

France: Like many other Western European Countries, the economy entered a depressive period also in France after 1979 oil crisis. While prices and wages were freezed in the socialist government under the presidency of Mauroy, a complete stability policy couldn't be applied. The transfer of funds from the budget to be made to nationalized companies were limited. The fact that budget opportunities were in hard times caused different thoughts to be born among the people who realized the nationalization. In 1985, people in favour of privatization were majority. Chirac put forward his targets about privatization clearly while presenting his governmental program as a President to Parliamentary after the March-1986 elections. With government's putting forward its will about this matter, the sales of 65 public institutions' shares in which 800 thousand workers are employed and which its total value is predicted between 150 and 300 billion French Francs have been ascertained. 12 of these institutions were privatized in 1986-1987 (Doğan, 1993).

Italia: This process begun with rare sales in 1980s. Besides, privatization was performed as of 1992 with big montans with the purpose of saving the country from a dramatic financial crisis, and it reached the peak with devaluation of Lire in September of 1992. This process gained speed after the pressure on public aids given to companies in bad condition applied by European Commission and because of the need for accommodating to the Maastricht Criteria. Altough compaines were sold in the mid 1992 and they became incorporated companies, privatisation only started at the end of 1993 with the formation of the sales calendar. Even though privatisation activities started late in Italy, an income of about 100 billion $ was earned (Atasoy, 1994).

Poland: Development of the private sector dates back to the years following 1975. In the economical structure where the Socialist State idea was dominant, during the 1980s, Polish worker's councils were struggling for the transfer of the property to the workers. (Apaty, 1995). In 1988 when the share of the private sector in GDP was 5,4 %, % 7 in the employment, 5,9 % among the investments and 7,6 % in the GNP, the privatisation took an important place within the economical reforms. Between 1990 and 1998, 70 % of all the public enterprises which correspond to 6.129 enterprises in number were privatised. Common privatisation experienced in 1993 took an important role in the privatisation process. Privatisation was realised through transfer of owner's equity, direct sales and transfer to the workers . However in 1997, the private sector constituted the 58,7 % of the GDP and 68 % of the total employment. As of 2000, 69,5 % of the total industrial production, 69,7 % of the total employment and 6,9 % of the total investments are carried out by the private sector (Apaty, 1995). Besides, Poland draws attention of the foreign investors. It would be more correct to evaluate the privatisation activities in Poland as privatisation resulting from the change in the economical system of the state rather than withdrawal of the state from the private sector (Bastırmacı, 2002).

Argentine: Main objective of the privatisation practices in Argentine is to increase the efficiency of the enterprises with poor efficiency through their transfer to the private sector and to generate income for the state that is on the point of the moratorium phase. A privatisation program was adopted in this country depending on the economical objectives rather than social objectives. First practices related to the privatisation policies of Argentine were realised by the goverment led by Rauf Alfonsin in 1985. At this period, 4 public enterprises were privatised and an income of 32 million $ was earned. Privatisation practices could not develop at the period due to the pressures of the public opinion. Carlos MENEM who came to the power in 1989 prepared a reform package restricting the power of the state on the economy in order to overcome the financial crises with which the country was struggling. Privatisation practices started in the real sense only after the government persuaded the public that the import subsitution and protective economy of the state would recover with the sale of the public institutions which lost their efficiencies. The government made the capital stock of the economy which was on the point of banktrupcy in 2000 when the government came to power to 73

billion $ in 2005. It applied privatisation process to many fields ranging from media to metro, from petroleum chemicals industry to telecommunication. Even the cemetary of the municipality of Buanes Aires was privatised (Eker, 1994).

Bresil: In Bresil where the first privatisation practice was realised by the military government, the main objective of the privatisation was to pay the debts as in the other countries of America. Between 1981-1984, 20 public enterprises were privatised and an income of about 190 million $ was generated. A law adopted 8 months after the termination of the military government in November, 1985 changed the privatisation process. Interministerial privatisation council was established under the presidency of the ministry of planning. The council determined certain legal principles concerning the privatisation (Bilgin, 1998). Bresil which performed one of the most extensive privatisation programs of the world between 1991 and 2002 privatised many public enterprises, amounting to 105 billion $ in total, the majority of whom was composed of the service sector. foreign capital inflow reached to 16,5 billion $ as of 2002 (Undersecretariat of Foreign Trade, General Directorate of Agreements, country report). Considering the objectives of the privatisation practices in Bresil, it is thought that they display similarities with the objectives of the privatisation practices performed in Turkey since 2002.

Privatisation in Turkey

Expropriation trend starting in the European Countries in particular after the World War II intensified especially following the first petroleum crisis which took place in 1973. While the share of the public sector employment was 8,3 % in the total non-agricultural employment in 1973, this share reached to 12, 8 % at the beginning of 1983 (this rate was only around 10 % in Turkey). Importance of the public sector continuously increased until 1986 in France and until 1984 in AFC. However, following the second petroleum crisis in 1979, the privatisation trend gained popularity in the European Countries, in England in particular, to overcome the blocks in the capital accumulation and the technological backwardness. However, with the effect of the economical distress, importance of the State Economic Enterprises (SEEs) decreased but the importance of the public sector did not decrease but increased slightly in 1980s (Aksoy, 2006). Privatisation trend in the developing countries is related to the new formations such as relevant demands of the international financial institutions and transfer of public enterprises in exchange for external debt. Due to the deficiency of the domestic capital accumulation and the weakness of the capital market, privatisation took the form of transfer to the foreign capital in these countries. In Turkey, legal framework of the privatisation process which developed as a part of the stability program dated 24 January 1980 was constituted by the law no. 2983 establishing the Public Partnership Fund in March, 1984 at the beginning, the statutory decree on the SEEs no. 233 and dated June 1985, law no. 3291 and dated May 1986 on the privatisation of the SEEs and the law no. 3332 and dated March 1987 concerning the encouragement of the capital market, spreading the capital to the public and the measures to be taken to improve the economy. Statutory decree no. 308 and dated January 1988 which aimed at facilitating the privatisation by regulating the contracted personnel employment was annulled by the Constitutional Court (Çevik, 2007). The most discussed method in the privatisation practices in 1980s was the selling of equity shares of the incorporated SEEs completely or partially to the private or legal entities via the capital market.

In the cases where the capital market did not develop sufficiently or it was not possible for the market to absorb the SEE shares to be marketed in a short time, stock shares could be submitted to the clients directly by tender but still by using the marketing mechanisms of the financial system. In the block sale to a few or only one client, value of the asset is made the matter of negotiation or offer instead of the stock shares, SEEs are divided and their profitable units which can be marketed easily are sold off or only the small size state enterprises are sold through this method. The selling of the big SEEs with this method becomes possible only with the participation of multi-national companies among the buyers (Tan, 1992). If the small sized privatisation practices launced by the Public Partnership Fund after 1985 in the priority regions for development are set aside, the first privatisation performed through the capital market was the sale of the public shares of Teletaş in which the majority

of the shares was essentially held by the private sector. As the capital market had difficulty in dealing with such a small sized share selling amounting to 15 billion turkish liras, the following trials were made as block sales. In August 1989, 70 % of Uçak Servisi A.Ş. (USAŞ) and in September 1989 five cement factories of Türkiye Çimento ve Toprak Sanayii Türk A.Ş. (ÇİTOSAN) were sold to the foreign investors. The fact that the privatisation somewhat became "foreignisation" led some people and groups to react to the privatisation and this form of practice, in particular, and some political parties filed cases in the Council of State to annul this practice. Those who oppose to this practice argue that the law no. 6224 allows the foreign investment inflow only in the non-monopolized fields and the Constitution envisages the adoption of a separate law for each privatisation (Turgut, 1992).

III. Privatisation Practices in the Cement Sector

Cement is a substance composed of limestone, clay, plaster and petroleum coke as fuel. There is no certain information concerning where and how the cement, or more precisely, the water lime was firstly found or produced in the world. It is estimated that it dates back to 2000 before the Christ. In Turkey, the first cement plant was established in 1911 in Darıca, İstanbul by Aslan Çimento which was a private enterprise. But the development of the cement industry in Turkey took place largely after 1950. A public enterprise, ÇİTOSAN was established in 1953 by the state to set up 15 cement plants at various parts of the country. The first privatisation practice in the cement sector of Turkey started with the block sale of 5 cement factories operating as partnership affiliated to ÇİTOSAN to the firm of Ciment Francais. The cement sector which pays taxes amounting to 500 million dollar in total exports 25 % of the production. Currently, there is no cement factory belonging to the state in Turkey. This sector held the first position in the Europe and the seventh position in the world in terms of production and exportation with its 52 cement factories. In the sector where 24 cement factories were privatised, a capital spending amounting to 662 million 253 thousand 833 dollar was realised after the privatisation within the framework of European Union harmonisation and environment standards. In Turkey, the expected objective of the privatisation studies was to ensure a more profitable and quality functioning of the cement industry, to expand the investment areas and to increase the employment with the growth of the sector. We have previously noted that the competition and privatisation concepts are always interrelated. Our cement sector also recorded a notable success by creating an internal auditing mechanism as well as the source that it generated in the investment spending after the privatisation. This means that they launched a self-control application except for the audits carried out by the state and the Competition Authority. Internal Audit Committee is composed of the representatives of the industry, state, university and sector. Objective of this internal audit is to increase the efficiency in production and quality. Consequently, the cement sector has even gone beyond the European Union standards in production, quality and environmental impact. Currently, it has an important place in the industry and the economy of the country with its annual added value of 1.5 billion dollars offering more than 25.000 employments, exportation potential of 200 million dollars and tax contribution of about 400 million dollars. Some of the privatised cement companies are traded at IMKB (İstanbul Stock Exchange). Operational performances, productions and sales of these companies affect their market values. For example, Afyon Cement and Niğde Cement companies are traded at IMKB. Afyon Cement plant was privatised in 1993 and Niğde Cement plant was privatised in 1997. After Niğde Cement company was privatised, a considerable increase was observed in its market value. This is because of the fact that the general economical conjoncture made positive contributions to the increase of the stock exchange and the company also increased its investment expenditures after the privatisation. Thus, the efficiency, production and sales showed increase (İpek, Aydın; 2009).

IV. Financial Tables and their Analysis

Financial tables are standardised accounting records which are obligatory for some companies with respect to the Turkish Tax Law, Turkish Commercial Law and Capital Market Law, a company have to prepare and publish at the end of its periodical activities and display the performance of the company in question. Financial tables can be listed as balance sheet, income table, cost of the sold goods, profit distribution, fund and cash flow, changes in equity statements. Among these tables, balance sheets and the income tables are the main financial tables. The others are considered as additional financial tables. Companies which are open to the public and whose stock shares are traded in the stock exchange have to disclose these tables to the public regularly and to submit to the relevant institutions. Financial table users (creditors, investors, partners, managers etc.) obtain the information concerning the performance of the companies by analyzing the relevant tables.

Balance Sheet

Balance sheet is a table that is prepared and published by a company concerning their periodical activities at the end of the relevant period and reveals the situation of the company.

In other words, it is a financial table indicating the assets owned by an enterprise at a specific period and the sources from which these assets are derived (Gücenme, 1996). A balance sheet is composed of assets of a company on one side and its liabilities and equities on the other side.

Income Table

Income table is a financial table which displays all the incomes that an enteprise collects at a specific accounting period as well as its costs and expenditures in a classified manner and summarizes the result of the periodical activity in terms of profit or loss (Akgüç, 2011).

As to the financial analysis, it is performed to examine the relationships between the items included in the financial tables and the trends observed in the course of time with the aim of determining whether the financial structure of an enterprise and its activity results are sufficient and making predictions (Gücenme, 1996). Financial analysis is carried out on the basis of the information given in the financial tables. There are certain analysis types used while making a financial analysis. The most common types can be listed as follows (Akgüç, 2011):

Comparative tables analysis:
Vertical analysis
Trend analysis (Trend Percentages Analysis)
Ratio Analysis

RATIO ANALYSIS: In the ratio analysis, mathematical relations are set between the interrelated items and items are expressed as folds or percentages of each other. The obtained results are interpreted according to the required percentages and coefficients. This analysis reveals the situation of the company when compared to the other companies and the sector.

In this study, our aim was to examine the financial tables of the cement factories before and after the privatisation comparatively through the ratio analysis. As liquidity ratios, ratios concerning the financial structure, activity ratios and profitability ratios are examined in the ratio analysis, these ratios are explained below:

Liquidity Ratios

1. Current Ratio
2. Acid-Test Ratio
3. Cash Ratio

Ratios Related to the Financial Structure

1. Debt Ratio (Total Liabilities/ Total Assets)

2. Debt/Equity Ratio
3. Short-Term Liabilities/Equity Ratio
4. Interest Coverage Ratio

Activity Ratios

1. Accounts Receivables Turnover Rate
2. Stock Turnover
3. Asset Turnover

Profitability Ratios

1. Net Profit /Equity
2. Earning Capacity of the Assets
3. Gross Profit Margin
4. Activity Profit/Net Selling Price:
5. Net Profit Margin

V. Afyon Cement Plant Application

Afyon Çimento Sanayi T.A.Ş (AÇS) was established in 1954 with a capital of 5 million Turkish Liras. It started its production activity in 1957 with a capacity of 85 thousand tons/year. Public shares of AÇS were transferred to the Presidency of Mass Housing and State Partnership Administration and in 1989, 51 % of its shares was sold to a French firm Sociate Ciments Francais in exchange for 13 million USD dollars (French Ciments Francais was bought in 1992 by the Italian firm, Italcementi which operates in the cement sector since 1864). Other public shares were later sold through the method of public offerring and firstly 2.6 % of them and then 39.87 % were sold in 1990. Afterwards, a share of 3 % was sold at IMKB in 1991 and lastly a share of 4.12 % was sold in 1994. (Directorate of Privatisation Administration, 2007). As of 05.05.2011, in AÇS, shareholders and their shares in the capital are as indicated below:

Table 1: Shareholders and their shares in the capital in AÇS as of 05.05.2011

Commercial Title /Name-Surname of the Shareholder	Share in the capital(TL)	Share in the capital (%)
Ciments Francais	1.530.000.00	51.00
Public Shares	1.469.975.00	49.00
Other	25.00	0
Total	**3.000.000.00**	**100**

Source: http://www.kap.gov.tr/yay/Sirket/Sirket.aspx?sirketId=833&btnAra=Git 15.01.2012

Ratios of 1989

A Liquidity Ratios

1- Current Ratio= $\frac{\text{Current Assests}}{\text{Short-Term Loans}} = \frac{11.169.963}{5.772.998} =$ **1.93**

2- Acid-Test Ratio= $\frac{\text{Current Assets – Stocks}}{\text{Short-Term Loans}} = \frac{11.169.963 – 5.128.890}{5.772.998} =$ **1.04**

3- Net Working Capital= Current Assets- Short-Terms Loans
= 11.169.963-5.772.998
= 6.041.073

B Profitability Ratios

$\frac{\text{Net Sales-CoGS}}{} \quad \frac{38.010.230-23.552.469}{}$

1- Gross Profit Margin= $\frac{\text{Net Sales}}{\text{Net Profit}} = \frac{38.010.230}{3.437.945} = \mathbf{0.38}$

2- Net Profit Margin= $\frac{\text{Net Sales}}{\text{Net Profit}} = \frac{38.010.230}{3.437.945} = \mathbf{0.09}$

3- Equity Profitability = $\frac{\text{Equities}}{\text{Net Profit}} = \frac{6.902.697}{3.437.945} = \mathbf{0.49}$

4- Total Assets Profitability= $\frac{\text{Total Assets}}{14.449.942} = \mathbf{0.23}$

C Leverage Ratios

1- $\frac{\text{Total Debts}}{\text{Equity}} = \frac{754.725}{6.902.697} = \mathbf{1.09}$

2- $\frac{\text{Total Debts}}{\text{Total Assets}} = \frac{754.725}{14.449.942} = \mathbf{0.05}$

3- $\frac{\text{Short-Term Debts}}{\text{Total Debts}} = \frac{6.772.998}{14.449.942} = \mathbf{0.46}$

4- $\frac{\text{Long-Term Debts}}{\text{Total Assets}} = \frac{1.874.247}{14.449.942} = \mathbf{0.12}$

5- $\frac{\text{Equities}}{\text{Total Assets}} = \frac{6.902.697}{14.449.942} = \mathbf{0.47}$

6- Interest Coverage Ratio= $\frac{\text{(PBIT)}}{\text{Interest Expenses}} = \frac{6.785.301}{11.799} = \mathbf{575}$

Ratios of 2010

A Liquidity Ratios

1-Current Ratio= $\frac{\text{Current Assets}}{\text{Short-Term Debts}} = \frac{33.727.106}{8.754.357} = \mathbf{3.85}$

2-Acid-Test Ratio= $\frac{\text{Current Assets – Stocks}}{\text{Short-Term Debts}} = \frac{33.727.106- 5.516.177}{8.754.357} = \mathbf{3.22}$

3-Net Working Capital= Current Assets- Short-Term Debts
= 33.727.106 - 8.754.357
= 24.972.749

B Profitability Ratios

1- Gross Profit Margin= $\frac{\text{Net Sales- CoGS}}{\text{Net Sales}} = \frac{45.076.732- 39.878.809}{45.076.732} = \mathbf{0.11}$

2-Net Profit Margin= $\frac{\text{Net Profit}}{\text{Net sales}} = \frac{567.427}{45.076.732} = \mathbf{0.01}$

Net Profit 567.424

3-Equity Profitability = ---------- = ---------- = **0.01**
Equities 53.359.402
Net Profit 567.424

4-Total Assets Profitability= ---------- = ---------- = **0.008**
Total Assets 64.405.715

C Leverage Ratios

Total Debts 11.046.313
1 ---------- = ---------- = **0.20**
Equity 53.359.402

Total Debts 11.046.313
2- ---------- = ---------- = **0.17**
Total Assets 64.405.715

Short-Term Debts 8.754.357
3- ---------- = ---------- = **0.13**
Total Debts 64.405.715

Long-Term Debts 2.291.956
4- ---------- = ---------- = **0.03**
Total Assets 64.405.715

Equities 53.359.402
5- ---------- = ---------- = **0.82**
Total Assets 64.405.715

(PBIT) 719.875
6- Interest Coverage Ratio= ---------- = ---------- = **3.42**
Interest Expenses 210.345

When ratios of Afyon Cement Plant belonging to 1989 were examined, a typical sample of the monopoly market. Monopoly is the market in which there is only one producer, other producers are not allowed to enter and the dominant producer regulates the market conditions at its own will. Prior to privatisation, cement companies whose lion shares were possessed by the state were dominant in the cement market. This dominance provided these companies with the opportunities of determining the market conditions and imposing these conditions to the market. Afyon Cement Plant became one of these enterprises which made use of the advantage of being unique in the region. This situation is clearly demonstrated by the ratios belonging to 1989.

Afyon cement plant appears to have a good position for 1989 in terms of the acceptable general limites of liquidity. In case of a probable problem, it is required that the short-term assets should double the amount of short-term debts. According to this general acceptance, current ratio of Afyon cement plant of 1.93 is quite close to the mean value of 2. Acid-Test ratio which is expected to be 1 was 1,04 for Afyon cement plant. This plant has a net working capital of 6.041.073 Turkish Liras. A working capital amounting to 6.041.073 for a firm whose size of assets is about 15 million TL can be considered as an element indicating that the enterprise will not have trouble in case of a probable crisis.

Obviousness of the monopolistic feature of Afyon cement plant also reflects to its profitability ratios. While gross profit margin of the plant was 38 % at this period, its net profit margin was 9 %. This rates can be accepted to indicate that there was not a good cost management in Afyon cement plant. Equities profitability was 50 % while the total assets profitability was 23 %. These figures can not be encountered in a market where the competition conditions are equal and there are more than one producers. A capital invested in a new enterprise amortizes itself in 2 years. Such an income can never be obtained through any investment in any part of the world.

In terms of the leverage ratios, it seems to have a good position depending on the advantages provided by the monopoly market. Its equity corresponds to only 1.09 % of its debts while its assets constitute solely 5 % of its total debts. Afyon cemen plant has the capacity of covering its debts with its equity. Additionally, its total debts correspond to only 5 % of its assets.

It is recommended that borrowing should be largely long-term. However, short-term debts constitute 46 % of all the assets. This finding shows that Afyon cement largely borrowed on a short-term basis at that period. This attitude can be accepted as an indicator of the confidence caused by being the only producer around Afyon. But in case of a probable debt crisis when the state protection lacks, Afyon cement plant could have serious problems. Long-term debts of Afyon Cement Plant correspond to 12 % of its assets. This widely accepted situation reversed in Afyon cement plant.

Afyon cement plant met the 47 % of its assets by its equities. This figure of 47 % demonstrates that Afyon Cement plant established a good equity-assets balance. It seems that Afyon cement plant has a good position in terms of interests in 1989. Its interest coverage ratio is relatively good. As its cash flow was sufficient at that period, it did not need to use loans and this situation reflected to the ratio. Even though the profit before interests and taxes is 6.785.301 TL, its interest burden is 11.799 TL.

When 2010 ratios of Afyon Cement Plant were examined, transition from the monopoly market to the free market is clearly reflected. In a free market, there are more than one producers in the market, any producer is allowed to enter in the market at its own will, competition under equal conditions balances the prices in the market in favor of the consumer, prices are not regulated by an authority, there is not any protective umbrella. After the privatisation, lion's share passes to the private sector from the state in the cement sector. This transfer brought an intense competition with it to the cement sector. This situation is clealy indicated in 2010 ratios of Afyon cement plant.

Afyon cement plant seems to have a good position in 2010 beyond the generally-accepted limits in terms of the liquidity. In case of a probable problem, it is required that the short-term assets should double the amount of short-term debts. According to this general acceptance, Afyon Cement Plant is highly above the mean value 2 with its current ratio of 3.85. Acid-Test ratio which is expected to be 1 is found as 3.22 for Afyon cement plant. It has a net working capital of 24.972.749 TL. A working capital amounting to 24.972.749 TL for a firm whose size of assets is about 65 million TL can be considered as an element indicating that the enterprise will not have trouble in case of a probable crisis. Furthermore, another reason of these relatively high liquidity ratios may be the attention paid by the enterprise management not to be caught unprepared in any probable crisis due to the lack of state protectionism. However, meanwhile, abundant assets remain inactive and accordingly, alternative incomes are ignored.

An important indicator of the fact that Afyon cement plant operates under free market conditions can be the profitability ratios. Gross profit margin amounting to 38 % in 1989 is not encountered at this period. Free market conditions do not allow such high profits. Thus, the gross profit margin becomes 11,5 % at this period. Besides, it is seen that cost management has developed considerably. The difference of 29 % between the gross profit margin and the net profit margin in 1989 reduced to 10 %. Net profit margin of Afyon Cement plant is 1,2 %. Although the difference between the gross profit margin and net profit margin decreased, profitability was relatively low at this period. This is another inidicator of the intense competition in the market. Afyon cement plant recorded a ratio of 1 % in its equity profitability and 0,08 % in its total assets profitability. These figures are relatively low. They even indicate clearly that the capital invested in the assets is not used effectively.

In terms of leverage ratios, Afyon cement plant seems to have a rather good position in 2010. Its equity is five folds more than its debts. Its assets correspond to 17 % of its total debts. It has the capacity of covering its debts with its equity easily. Besides, its total debts constitute only 17 % of its assets.

It is recommended that borrowing should be largely long term. Afyon cement plant has a relatively short term debts structure in accordance with this rule. Its short term debts correspond to 13.5 % of its assets. However, long term debts had a ratio of 3.5 % at this period. This finding indicates that Afyon cement plant uses its equities in its transactions and approaches cautiously towards borrowing. This finding is also confirmed by the equities/total assets ratio. 82.8 % of the assets are met by the equities of the company. However, alternative cost of the capital is ignored by the top management of Afyon cement company.

Afyon cement also has a good position in terms of interests in 2010. Its interest coverage rate is relatively good. As it operates depending on its own equity, an interest-related problem is not observed and expected.

Thus, its profit before interests and taxes is 3.42 times more than its interest expense.

Conclusion

It was inevitable that the privatisation practices leading the world in 1980s would also affect Turkey. Privatisations starting in the whole world with the emergence of the privatisation practices came to Turkey rather late. Political conflicts in the country, negative approaches of the worker syndicates towards privatisation, political instability , legal gaps and the privatisation practices annulled by the courts due to these gaps played important roles in this delay. Besides, because of these delays, privatisation of Türk Telekom whose estimated value was 25 billion $ in 1990s was realised only towards the end of 2000s in exchange for around 6 billion $. As of 2012, there are many public enterprises to be privatised.

The concept called as new world order requires that the states remain in the sectors including security, justice, health and education and the other works are conducted through the private sector. Furthermore, when the state which is a complex structure takes a weighted place in the economy, the economy becomes ineffective and closed to the developments.

Main reason of the collapse of the old Soviet block is also indicated to be the deterministic power of the state in the economy and thus, the loss of the comptitiveness.

In Turkey, privatisations should be completed without delay and the state control on the economy should be removed. One of the privatisations realised to this end is the privatisation of Afyon cement plant. Afyon Cement Plant is now a stock corporation traded in İstanbul stock exchange. As can be indicated by the ratios, the company is in a good condition except for its equities profitability and assets profitability resulting from extreme cautiousness. By privatising this enterprise, the State both got rid of a burden and obtained a considerable amount of tax income in the course of years. Besides, owing to these privatisations, a technological innovation called as concrete plants was introducted to Turkey and these concrete plants resulted in more quality concretes for the buildings.

As a conclusion, realisation of the privatisations as soon as possible as a necessity of the present age is considered to be for the benefit of both the state and the society.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

The Role of Inflation Regime in the Exchange Rate Pass-Through: Evidence from Mexico, Israel and Turkey

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Abstract

The degree of pass-through from exchange rate changes into domestic inflation- which is known as exchange rate pass through (ERPT) is crucial for implementing monetary policy. The level of the ERPT affects inflation forecasts and monetary transmission mechanism and setting monetary policy. Central banks aiming at stabilizing prices need to know how the previous exchange rate changes have affected the current import prices. As the ERPT lowers, central banks obtain more ability to conduct monetary policy freely. J.B. Taylor (2000) suggests that decline in ERPT in recent years is due to a change in the behaviour of inflation and ERPT is lower in low inflation environment and moving to a stable macroeconomic environment provides a weaker ERPT. The purpose of this paper is to examine the ERPT in the transition to low and stable inflation environments by using the data set of three emerging markets namely Mexico, Israel and Turkey. Because of the presence of nonlinear mechanisms in the ERPT, we use smooth transition models, and explore the existence of non-linearities. Our results reveal that ERPT is non-linear in these countries and the period of low ERPT is associated with the low inflation environment, in line with Taylor's (2000) hypothesis.

Keywords: Exchange rate, Inflation, Monetary policy, Smooth transition regression, Emerging markets
Jel Classification Codes: E52, F31, F41

1. Introduction

Exchange rate pass-through (ERPT) refers to the transmission of exchange rate changes into the local currency prices of traded goods[1].Goldberg and Knetter (1997) define ERPT as "*the percentage change in local currency import prices resulting from a one percent change in the exchange rate between the exporting and importing countries*". The pass-through process consists of two stages. In the first stage,

[1] Full or complete ERPT means a one-to-one response of import prices to exchange rates. A less than one-to-one response is treated as 'incomplete' or 'partial' ERPT.

exchange rate movements are transmitted to import prices, while in the second stage, changes in import prices are reflected in the consumer price index (CPI)[2] Bailliu, 2010).

Pass-through from exchange rate changes into domestic inflation has various implications for implementing monetary policy. The degree of ERPT is very important for accurate forecasting of inflation (Bailliu and Bouakez, 2004) and responding to the potential shocks affecting the dynamics of inflation (Mishkin, 2008; Engel, 2009).Under high ERPT to prices, emerging market central banks become more sensitive to exchange rate fluctuations because there should be a constraint with regards to implement monetary policy due to the fear of floating (Calvo and Reinhart, 2002). Furthermore, the degree of ERPT is critical for the assessment of monetary rules in emerging market economies (EMEs).With high ERPT, stabilising the exchange rate involves a trade-off between real stability and inflation stability. As the ERPT lowers, central banks obtain more ability to conduct monetary policy in order to maintain price stability (Eichengreen, 2002; Devereux et al., 2006).

Another reason for the importance of ERPT in monetary policy implementation is about its role as a "shock absorber" (Edwards, 2006).If import prices are less responsive to the changes in the exchange rate, this could lead to a dampening of expenditure-switching effects. As the exchange rate depreciates, the expenditure-switching effect helps to redirect consumption and investment in a country with a trade deficit away from imports, and making the country's exports more attractive to foreigners. In this context, the degree of ERPT also determines the benefits of flexible exchange rate regime (Bailliu, 2010). As the low ERPT lowers the expenditure-switching effect, the extent of monetary policy effectiveness for dealing with real shocks will improve (Campa and Goldberg, 2002).The degree of ERPT is also crucial for the international transmission of monetary shocks (Betts and Devereux, 2001).When ERPT is incomplete, monetary policy produces a positive co-movement of output across countries which imply that business cycles are becoming more synchronized.

J.B.Taylor (2000) suggests that decline in ERPT in recent years is due to a change in the behaviour of inflation. ERPT is lower in low inflation environment and moving to a stable macroeconomic environment provides a weaker ERPT. This study investigates the ERPT in the transition to low and stable inflation environments by using the data set of three emerging markets namely Mexico, Israel and Turkey. Because of the presence of non-linear mechanisms in the ERPT, we use smooth transition models and explore the existence of non-linearities. Our findings provide strong support to Taylor's (2000) hypothesis. The rest of paper is organized as follows. Section 2 presents the literature concerning the relation between the ERPT and inflation dynamics. Section 3 describes the theoretical background and the methodology. Section 4 presents model specification and the empirical results. Section 5 is reserved for conclusion.

2. Literature Review

Recent literature on ERPT has shown that ERPT into domestic inflation has been declining during the last two decades. In this period it is observed that inflation in both developed and EMEs is no longer a problem and price stability is ensured globally (Mishkin and Schmidt-Hebbel, 2007). Although several factors are thought to have contributed to this trend, decline in inflation is ascribed to a shift towards more credible monetary policy regimes (Stock and Watson, 2003; Goodfriend, 2007).Because of the decline in ERPT has coincided with a transition to a low inflation environment, the belief that these two phenomena could be linked has emerged among central bankers. This coincidence has led to growing interest in analyzing the relationship of the ERPT with monetary policy conduct and inflationary environment. However, there is no consensus on the reasons that cause to a low ERPT.

Recent new open economy macroeconomics (NOEM) literature has stressed the role of microeconomic factors based on international trade such as the responsiveness of the elasticity of demand with respect to the exchange rate, the market structure and competitiveness, the weight on

[2] It is also mentioned that ERPT refers to the effects of exchange rates on inflation especially for emerging market economies.

imported intermediate goods in the production function for domestic goods (Campa and Goldberg, 2002), the composition of goods in the basket of price index (Campa and Goldberg, 2006), and price discrimination in international markets (Corsetti and Dedola, 2002). This literature has argued that microeconomic factors are played more important role in determining ERPT into domestic inflation and these factors are exogenous to monetary policy.

Another strand of the literature concentrates on the endogenous nature of ERPT in designing monetary policy. Therefore, ERPT should be taken as endogenous to a country's inflation performance[3]. Taylor (2000) was the first to point out this view and put forth the hypothesis that the link between exchange rate changes and prices depends positively on the rate of inflation and recently observed decline in the ERPT into prices is due to low inflation environment.

Taylor (2000) demonstrates the link between ERPT and inflation with a model based on staggered price setting and monopolistic competition behaviour where firms set prices for several period in advance, they are more responsive to cost increases due to exchange rate changes or increase in the price of inputs if cost changes are perceived to be more persistent. Since the economy will be exposed to more persistent shocks in high inflation regimes, ERPT tend to increase. In this context, ERPT depends on the policy regime, which tends to be reduced in an environment where inflation is low and monetary policy is more credible. In related study, Devereux and Yetman (2003) argue that the frequency of price changes of importing firms declines with increasing credibility of monetary policy. Thereby, the degree of ERPT is endogenous to monetary policy and its credibility.

Drawing on the work by Taylor (2000), the link between pass-through and inflation has been examined in many studies. Gagnon and Ihrig (2004) investigated whether the change in pass-through in 20 industrial countries between 1971 and 2003 is explained by change in inflation regime. They find an evidence of a robust and statistically significant link between estimated rates of pass-through and inflation variability and the decline in pass-through is explained by low inflation environment, in line with Taylor's hypothesis. Bailliu and Fujii (2004) explored the same question by using panel data for 11 industrialized countries over the period from 1977 to 2001. Their results indicate that pass-through declines with a shift to a low inflation environment brought about by a change in monetary policy regime and its credibility.

By using a model that consists of imperfect competition and staggered contracts, Choudri and Hakura (2006) also found strong evidence that the relation between the pass-through and the average inflation rate is positive and significant for a large sample of developed and EMEs. In their study, the inflation rate dominates other macroeconomic variables in explaining cross-country differences in pass-through. Sekine (2006) estimated of six industrialized countries using a time-varying parameter with stochastic volatility model from 1974 to 2004. This study revealed that the decline in the second-stage pass-through is associated with the emergence of the low and stable inflation environment but this link is weak for the first-stage pass-through. On the other hand, contrary to Taylor hypothesis, Campa and Goldberg (2005) argued that since there is a low inflation in OECD countries, inflation environment is not the first order determinant of ERPT to import prices. In these countries, the lower EPRT is explained by a change in the composition of the dramatic shifts in the composition of country import bundles[4].

The decrease in ERPT in recent years is a fact observed not only for the developed economies bu also in EMEs. According to a survey conducted by BIS (Mihaljek and Klau, 2008), 10 out 15 of emerging market central banks declared that ERPT has declined. Calvo and Reinhart (2000) and Goldfajn and Werlang (2000) have examined the conventional wisdom and shown that ERPT into both import and consumer prices is always higher in EMEs than in developed economies. There are some microeconomic explanations for this observation. First, as the EMEs are small open economies,

[3] In this literature, pass-through has been examined from a macroeconomic perspective based on microeconomic features such as nominal rigidities and market imperfections and the degree of ERPT has been a key issue in the design and implementation of optimal monetary policy (Smets and Wouters, 2002; Monacelli, 2005).

[4] As Nogueira Jr. et al. (2010) stated and Choudri and Hakura (2006) argued that Campa and Goldberg (2005) have used ERPT to import prices instead of consumer prices. As the price behaviour of foreign firms may not be strongly related to the domestic inflation environment, it would be more appropriate to use domestic prices to test Taylor's hypothesis.

producer currency pricing is widely used in price setting, hence, pass-through is complete. Second, the weight on imported intermediate goods in the production function for domestic goods, either in the form of raw materials or capital goods, is high in these economies. Since there will be inadequate substitution between imported and domestic inputs, prices of domestic goods directly captured the exchange rate changes (Kara et al., 2007).

From macroeconomic perspective, in line with Taylor's hypothesis, high and persistent inflation is also considered as an important reason of high ERPT in EMEs. Based on three alternative vector autoregressive models, Ca'Zorzi et al.(2007) tested the Taylor hypothesis for 12 EMEs. Their study reveal that the relation between the ERPT and inflation is positive, in line with Taylor's hypothesis once two outlier countries (Argentina and Turkey) are excluded from the analysis. Baqueiro et al. (2003) also confirmed the hypothesis for a group of six EMEs.

Contrary to these studies, Ho and McCauley (2003) surveyed possible determinants of ERPT for a group of EMEs. They obtained a positive but not very statistically significant relationship between inflation environment and pass-through. Mihaljek and Klau (2008) explored the same link for 14 EMEs between 1994 and 2006.Their results indicate that the relationship between inflation and pass-through is not particularly strong. However, there seems to be the relationship between the decline in the ERPT and the decline in the volatility of inflation. This result suggests that the more inflation has become stable the more the ERPT has tended to decline. Moreover, using a state-space model that allows ERPT to be time-varying and dependent on the inflation environment, Nogueira Jr. and Leon-Ledesma (2010) estimated the model for 12 developed and EMEs. Their study supports the decline in the ERPT but do not support the hypothesis that lower inflation precedes this declining in the data from 1980 to 2007.

The decline in ERPT is also explained by moving to full-fledged inflation targeting (IT) particularly in EMEs. Nougeira Jr. (2007) considers two channels through which the adoption of IT can lead to lower ERPT. Under IT, monetary policy aims to maintain price stability and inflation targets help the central bank to shape the expectations. As inflation expectations are firmly anchored, ERPT may reduce considerably. This is the first channel which arises when inflation is lowered and stabilized (Mishkin and Schmidt-Hebbel, 2007: Nogueira, 2007; Reyes, 2007; Coulibaly and Kempf, 2010; Prasert et al., 2010).

The second channel emerges from the credibility of central bank. Eichengreen (2002) emphasized that the main reason for a higher ERPT in EMEs is due to the lack of credibility of their central banks. When credibility is low, agents treat the temporary shocks as permanent and responsiveness of exchange rates to prices increase. However, commitment to price stability under IT, keep inflation expectations low following depreciations. In this sense, Mishkin and Savastano (2001), Schmidt-Hebbel and Werner (2002) and Kara and Öğünç (2008) have argued that the declining ERPT is a by-product of credibility gains of IT.In addition to these arguments, transition to flexible exchange rate regime with IT is evaluated as a different way of explaining the decrease in ERPT. The flexible exchange rate regime has been crucial in allowing the CB run an independent monetary policy aimed at price stability. Under this regime, exchange rate is no longer exclusively taking as a nominal anchor in the expectation formation and price setting behaviour of firms. Therefore, adopting flexible exchange rate regime along with IT is expected to lower ERPT (Kara et al. 2007; Nogueira Jr. and Leon-Ledesma, 2010).

On the other hand, there is a growing empirical literature engage on the issue that the ERPT might be non-linear and/or asymetric[5] (for example see, Bussiere, 2007; Cheikh, 2012).Devereux and Yetman (2010) analysed over 100 countries and obtained that there is a positive, but non-linear relationship between ERPT and average inflation. The reason for non-linearity arises from the fact that when inflation rises above some threshold level further increases in inflation has no effect on ERPT.

[5] Cheikh (2012) stated two potential sources of pass- through in generating nonlinearities.The first source of asymetry can arise from the direction of exchange rate changes i.e., in response to currency depreciations and appreciations. The second source of asymetry is related with the magnitude of exchange rate movements, i.e. depending on whether exchange rate changes are large or small.

Correa and Minella (2010) estimated models for the Phillips curve combined with the methodology of threshold models and explored the presence of a nonlinear pass-through from the exchange rate to inflation in Brazil. Their results indicated the presence of nonlinear mechanisms in the short-run pass-through in Brazil. Nogueira Jr. and Leon-Ledesma (2011) investigated the possibility of non-linearity of pass-through for Mexico. In their study, nonlinearity appears as a consequence of some measures of macroeconomic instability such as EMBI+ spreads of dollar denominated bonds and real interest rate differentials with the United States (US).They found that ERPT appears to be highly non-linear and depends on measures of market confidence which highlights the importance of a stable macroeconomic environment in reducing ERPT in EMEs.[6]

There are some studies that scrutinized the relationship between non-linearity and the role of low inflation environment in the spirit of Taylor hypothesis. Shintani et al. (2009) estimated the ERPT to US domestic prices. They found the supporting evidence of non-linearity in ERPT dynamics and the period of low ERPT would be associated with the low inflation environment. More recently Junttila and Korhonen (2012) have applied non-linear empirical methods to ERPT analysis for 9 developed OECD countries from 1975 to 2009.They argued that the degree of ERPT is affected by the inflationary environment that the exporting firms face in importing country in a non-linear way. This result support strongly the Taylor (2000) conclusion that low inflation regime has caused lower ERPT.

3. Theoretical Background and Methodology

3.1. Analytical Framework

Let us composition of the consumer price index has the following form:

$$P = P_{(NT)}^{\phi} P_{(T)}^{1-\phi} \tag{1}$$

where P is the consumer price level, P_{NT} is the price level of nontradable sector and P_T is the price level of tradable sector. ϕ is a bound parameter that arranges the share of each sector in the composition of consumer price index. Hence, inflation (π) equation can be written as the log difference of the price level

$$\pi = \phi\pi_{(NT)} + (1-\phi)\pi_{(T)} \tag{2}$$

By taking inflation's inertial behaviour into account and assuming one period lag, one can express the first term in equation (2) as following

$$\pi_{(NT)t} = \delta\pi_{(NT)t-1}\varphi\Delta y_t \tag{3}$$

where Δy_t denotes the output gap at time t.

In order to express second term in equation 2, we follow Junttila and Korhonen (2012), Nogueria Jr. and Leon-Ledesma (2011) and Cheikh (2012) and use a static partial equilibrium model in which a foreign monopolistic exporter's price equation at time t it is equal to

$$P_t = \theta_t E_t C_t^* \tag{4}$$

where, E_t is the nominal exchange rate, C_t^* is the exporting firm's marginal cost and θ_t is the mark up over marginal cost which is equal to $\eta/(\eta-1)$ where η is the positive price elasticity of demand. According to Bailliu and Fujii (2004) θ_t is depends on demand pressure in the importing country. Hence, $\eta = \eta(Y)$, with Y is the income level of the importing country. Therefore one can reach the standard ERPT equation by using the log linear form of the equation 4, that is,

$$p_t = KY_t + \alpha e_t + \beta c_t^* \tag{5}$$

[6] Nogueira Jr. and Leon-Ledesma (2008) have also examined the possibility of non-linear pass-through for a set of IT countries. They found that ERPT respond non-linearly to several macroeconomic factors, including inflation rate, the size of exchange rate changes, macroeconomic instability and output growth.

where, α is the ERPT coefficient and bounded between 0 and 1. While α is equal to 1, that means the pass-through is complete which is called as PCP, the situation α is equal to zero called as purely LCP.

On the other hand, as presented in introduction section, Taylor (2000) suggested that there is a positive correlation between ERPT and inflation. More precisely, lower and stable inflation environment proceed the declining the degree of ERPT. Indeed, Junttila and Korhonen (2012) and Cheick (2012) give empirical support of this hypothesis. Cheikh (2012) implies that a stable inflation environment in the importer country, may lead exporters to set prices in the importer's currency. Therefore, the exporting firm's marginal cost (θ) can be rewritten as follows

$$\theta_t = \theta(Y, E^{w(z)}) \tag{6}$$

where in this case Z denotes the response of the inflation environment in the importing country. The function $\omega(Z)$ works as a mark up multiplier and exporter firm responds more to the exchange rate changes if the importer country's inflation environment is high. Hence in this situation ERPT is high. Now, according to (4) and (6) log linear form for prices can be written as

$$p_t = Ky_t + \alpha e_t + \beta c_t^* + \psi w(Z) e_t \tag{7}$$

It is clear that different from equation 5, in equation 7 there is another channel of pass- through which depends on the inflation environment of the importing country. If one assume that there is two main regimes in importing country (high inflation regime and low inflation regime), $\omega(Z)$ can be written as following

$$w(Z) = \begin{Bmatrix} 0, if\ \pi_t \le \pi^*\ low \inf lation\ regime \\ \psi, if\ \pi_{t>} \pi^*\ high \inf lation\ regime \end{Bmatrix} \tag{8}$$

where, π^* represents a threshold level for inflation. Junttila and Korhonen (2012) stated that in the low inflation regime exporting firm can not use a PTM because of competitive environment but it can use full pricing to market strategy in the high inflation regime. Therefore, while in low inflation regime, ERPT coefficient is equal to α, in the high inflation regime it is equal to $\alpha + \psi$.

Rewriting equation 7 in difference form, yields following equation for import prices

$$\Delta p_t = k\Delta y_t + \beta \Delta c_t^* + (\alpha + \psi w(Z))\Delta e_t \tag{9}$$

Although equation 9 explains the import prices, following Nougeria Jr. and Leon- Ledesma (2011), we use it for the second term in the equation 2 (inflation level for the tradable sector). Finally, substituting (3) and (9) into (2) and after some arrangements yields

$$\pi_t = \delta \pi_{t-1} + [(1-\phi)k + \phi\varphi]\Delta y_t + (1-\phi)\beta \Delta c_t^* + (1-\phi)[\alpha + W(Z)]\Delta e_t \tag{10}$$

Equation 10 is a threshold representation because of function $\omega(Z)$ but following Korhonen and Junttila (2010), Junttila and Korhonen (2012), Nogueria Jr. And Leon- Ledesma (2011) and Cheikh (2012), we use smooth transition regression model, as there is probably some heterogeneity across firms in their attitude towards the state of the inflation environment.

3.2. Smooth Transition Regression

One can investigate an omitted non linear component of smooth transition regression (STR) type in the linear relationship by considering the following model[7].

$$y_t = \phi' z_t + \theta' z_t G(\gamma, c, s_t) + u_t \quad \text{t=1,2.....T} \tag{11}$$

where $z_t = (w_t', x_t')$ is a vector of explanatory variables, $w' = (1, y_{t-1}.....y_{t-p})'$ and $x_t = (x_{1t}.....x_{kt})'$, which is a vector of exogenous variables. $\phi = (\phi_0, \phi_1, ..., \phi_m)'$ and $\theta = (\theta_0, \theta_1, ..., \theta_m)'$ are ((m+1)x1) vectors of unknown parameters and $u_t \sim iid(0, \sigma^2)$. G is a transition function which is continuous in

[7] The terminology that is used here belongs to Terasvirta (2004).

s_t and bounded between zero and one. γ is the slope parameter and $c=(c_1,.....c_k)'$ is the vector of location parameters which determines where the transition(s) occurs. If G has the form

$$G(\gamma,c,s_t)=\left(1+\exp\left\{-\gamma\prod_{k=1}^{k}(s_t-c_k\right\}\right)^{-1},\gamma>0 \tag{12}$$

the STR model is called logistic STR (LSTR) model. While K = 1 the transition function is monotonically increasing in S_t and model is called as LSTR1, K = 2 it changes symmetrically around the midpoint $(c_1+c_2)/2$ which is the minimum value attained by the function and model called as LSTR2. Therefore, LSTR1 model is suitable to describe economic phonemes whose properties are different in upswing and downswing phase of the economy, LSTR2 model on the other hand, is suitable to describe the behaviour of the process is similar at both large and small values of S_t and different in the middle. If G has the form

$$G(\gamma,c,s_t)=\left(1-\exp\left\{-\gamma(s_t-c_1^*)^2\right\}\right],\gamma>0 \tag{13}$$

the STR model is called exponential STR (ESTR) model. It is an alternative model the LSTR2 model since this transition function is symmetric around $s_t=c_1^*$.

Testing the null hypothesis of linearity, $H_0:\gamma=0$, indicates an identification problem in equation 9 since the model is identified under the alternative hypothesis but not under the null hypothesis. Luukkonen et al. (1988), Terasvirta (1994) and Terasvirta (1998) propose a course of circumvention for this problem through a third order Taylor series approximation to G around the null hypothesis. It can be written as

$$T_3=\delta_0+\delta_1 s_t+\delta_2 s_t^2+\delta_3 s_t^3+R_3(\gamma,c,s_t) \tag{14}$$

where, R_3 is a remainder, and δ_j are constants for j=1,2,3. If one substitutes equation 13 for G in equation 11, it yields following auxiliary regression

$$y_t=\beta_0^{'}z_t+\sum_{j=1}^{3}\beta_j^{'}z_t s_t^j+u_t^*,.....t=1.....,T \tag{15}$$

where $u_t^*=u_t+R_3(\gamma,c,s_t)\theta' z_t$. The null hypothesis of linearity can be expressed as

$$H_0:\beta_1=\beta_2=\beta_3=0 \tag{16}$$

The test statistic has an asymptotic χ^2distribution when the null hypothesis is valid. However, even moderate sample χ^2statistic can be size-distorted. Therefore instead of χ^2statistic, the corresponding F-statistic is recommended by Granger and Terasvirta (1993) to investigate the null hypothesis of linearity. Rejection of this null indicates evidence of non-linearity. The F test is performed with a range of potential transition variables[8]. If the null hypothesis is rejected for several transition variables, the transition variable chosen is the one which produces the minimum p-value for the F-test.

After rejection of linearity, one can use following sequence of null hypothesis in order to discriminate the models of non-linearity in STR type.

$$\begin{aligned}&H_{04}:\beta_3=0\\&H_{03}:\beta_2=0\,|\,\beta_3=0\\&H_{02}:\beta_1=0\,|\,\beta_2=\beta_3=0\end{aligned} \tag{17}$$

[8] See Lin and Terasvirta, (1994), if s_t is a time trend, the F-test becomes a test of parameter constancy in the linear model against STR type parameter non-constancy.

If the p value for H_{03} is the smallest one LSTR2 or ESTR model is chosen, otherwise LSTR1 model is chosen. It is also possible to fit both an LSTR1 and an LSTR2 or ESTR model to the data and make the choice between them at the evaluation stage.[9]

4. Empirical Model and the Results

According to above mentioned approach the ERPT is a non-linear function of the importing country inflation regime. The STR specification implies that the non-linear coefficient takes different values depending on whether the transition variable (inflation rate) is below or above the threshold. More precisely, our empirical model has the following form[10]:

$$\pi_t = \beta_0 + \sum_{i=1}^{n} \beta_{1,i}\pi_{t-i} + \sum_{i=0}^{n} \beta_{2,i}\Delta mc_{t-i} + \sum_{i=0}^{n} \beta_{3,i}\Delta y_{t-i} + \sum_{i=0}^{n} \beta_{4,i}\Delta e_{t-i} + \left(\beta_0^* + \sum_{i=0}^{n} \beta_{4,i}^*\Delta e_{t-i}\right).G(s_t,\gamma,c) + \varepsilon_t$$

where, π is the inflation rate, Δmc is the change in the foreign cost, Δy is the real output growth, Δe is the change in the nominal exchange rate and ε is the error term. Non-linear dynamic driven by $G(s_t,\gamma,c)$ which is the transition function in which s_t denotes the transition variable and in our case it is lagged values of inflation (π_{t-i}), γ is the slope parameter and c is the vector of location parameters which determines where the transition occurs.

One can define time varying pass through elasticises by using the estimated model parameters as following:

Short run ERPT: $\beta_{4,0} + \beta_{4,0}^*.\left(G(s_t,\gamma,c)\right)$

Long run ERPT: $$\frac{\sum_{i=0}^{n} \beta_{4,i} + \sum_{i=0}^{n} \beta_{4,i}^*.G(s_t,\gamma,c)}{1-\sum_{i=1}^{n} \beta_{1,i}}$$

The STR pass through equation is estimated for Mexico, Israel and Turkey and analysis conducted on quarterly seasonally adjusted data which was collected from IMF's IFS data base and it covers the period from 1990- Q1 to 2010- Q4. Inflation is the change in the CPI. Exchange rate is the change of the national currency per unit of dollar. Output growth is constructed using the rate of growth of the real GDP. To capture changes in foreign costs, we follow Campa and Goldberg (2005) and Junttila and Korhonen (2012), and define a cost proxy (mc) which is constructed by using nominal exchange rate (e_t) and real exchange rate series (re_t) and domestic price index (P_t), that is $mc = \frac{e_t}{re_t} x P_t$.

We start the analysis by specifying the adequate linear representation. In order to determine the lag structure, we use a VAR framework and adopt a general-to-specific approach, as suggested by van Dijk et al. (2002). To reach the final specification we start with a model with maximum lag length N = 4, and sequentially we remove the lagged variables for which the specification consists in testing for non-linearity, choosing the appropriate transition variable and the most suitable form of the transition function. We used non-linear least squares to estimate the parameters in the model, therefore, finding starting values for the estimation of parameters is crucial. Thus, we follow standard STR literature and construct a grid search for estimating starting values of λ and c.

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[9] For details on estimation and evaluation of STR models, see Terasvirta (1994) and Eirtheim and Terasvirta (1996).

[10] According to the empirical literature, the matter of whether these variables are cointegrated is open to dispute. Hence, following the standard practice, for example see, Choudhri and Hakura (2006); Ca'Zorzi et al. (2007); Gagnon and Ihrig (2004), Nougeria Jr. And Leon- Ledesma (2011) etc., we estimated the model in difference form.

Table 1 presents the linearity tests against the STR type non-linearity. By using up to 4 lags for the transition variable π_{t-i}, we find evidence of non-linear response of ERPT. According to Table 1, linearity null hypothesis is rejected for all countries. As a transition variable, while one period lagged inflation rate is chosen for Mexico and Israel, three periods lagged inflation rate is chosen for Turkey. The stronger rejection of H_{02} than H_{03} in Table 1 for all countries, leads to LSTR specification for modelling ERPT. After removing insignificant parameters, the following LSTR equations in Table 2 are obtained[11]. According to Table 2, the ERPT for these three EMEs contain a significant LSTR component which is driven by the lagged values of the12 month change of CPI. Given the estimated value of γ of 1.96, 11.24 and 8.14 for Mexico, Israel and Turkey, respectively, indicate that the transition between the two regimes is relatively smoother in Mexico than other two countries, as shown in Fig. 1 in parts (A), (B) and (C).

[11] A t-ratio of less than 1.28 in magnitude is considered as insignificant.

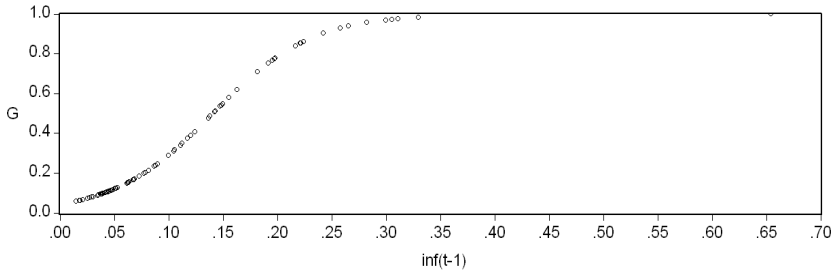
Table 1: Linearity Tests against STR Model $(s_t = \pi_{t-i})$

		Mexico			**Israel**				**Turkey**			
Transition Variable	π_{t-1}	π_{t-2}	π_{t-3}	π_{t-4}	π_{t-1}	π_{t-2}	π_{t-3}	π_{t-4}	π_{t-1}	π_{t-2}	π_{t-3}	π_{t-4}
H_0	**8.48e-14**	2.14e-04	4.25e-04	7.78e-01	**7.15e-08**	4.44e-04	1.36e-06	2.97e-06	8.92e-06	8.81e-06	**7.65e-07**	6.35e-06
H_{04}	**4.90e-02**	4.34e-01	8.69e-01	3.33e-01	**1.08e-04**	7.19e-02	6.30e-02	3.06e-03	8.81e-06	4.37e-02	**5.82e-02**	1.79e-01
H_{03}	**3.57e-04**	7.33e-05	2.33e-05	8.42e-01	**8.47-e02**	6.44e-01	1.03e-02	2.40e-01	8.39e-01	9.59e-01	**7.33e-01**	9.53e-01
H_{02}	**1.86e-12**	5.49e-02	9.64e-02	7.50e-01	**4.47e-05**	3.73e-05	5.86e-06	1.80e-04	7.93e-07	4.58e-07	**2.80e-08**	1.54e-07
Specification	**LSTR**	ESTR	ESTR	Linear	**LSTR**	LSTR	LSTR	LSTR	LSTR	LSTR	**LSTR**	LSTR

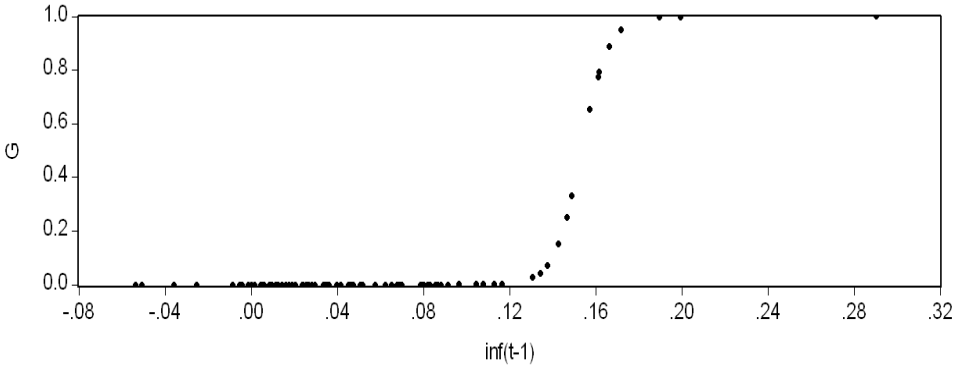
Note: The numbers are the test statistics of F versions of the LM linearity tests. First row shows the test of linearity against the alternative of STR type nonlinearity. The second row until the forth are the F statistics of the sequential test for choosing the adequate transition function. The decision rule is the following: if the test of H_{03} yields the strongest rejection of null hypothesis, we choose the ESTR model. Otherwise, we select the LSTR model. The last row gives the selected specification.

Figure 1: Plots of LSTR transition functions against transition variables π_{t-i}

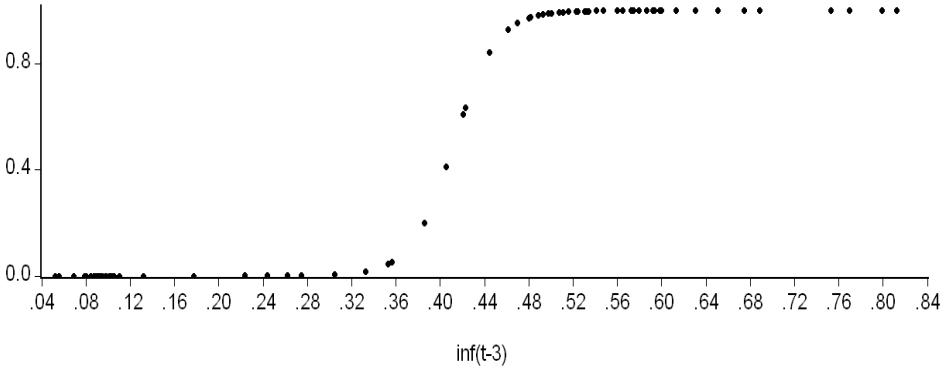
(A) Mexico



(B) Israel



(C)Turkey



Jarque–Bera test of normality produces a p-value of about 25%, 7% and 7% for Mexico, Israel and Turkey, respectively. According to the both tests, the LM test of no error autocorrelation up to forth order and the LM test of no ARCH effects up to forth order, the null hypothesis are not rejected. The LM tests of parameter constancy show that the parameters of the LSTR equations are also constant. The LM test of no remaining nonlinearity implies no sign of remaining nonlinearity in the residuals at the 5% significance level.

Table 2: Estimated LSTR Model with $s_t = \pi_{t-i}$

	Mexico		**Israel**		**Turkey**	
s_t	π_{t-1}		π_{t-1}		π_{t-3}	
c	0.1396	(0.00)	0.1568	(0.00)	0.4122	(0.00)
γ	1.96	(0.00)	11.24	(0.00)	8.14	(0.06)

Table 2: Estimated LSTR Model with $s_t = \pi_{t-i}$ - continued

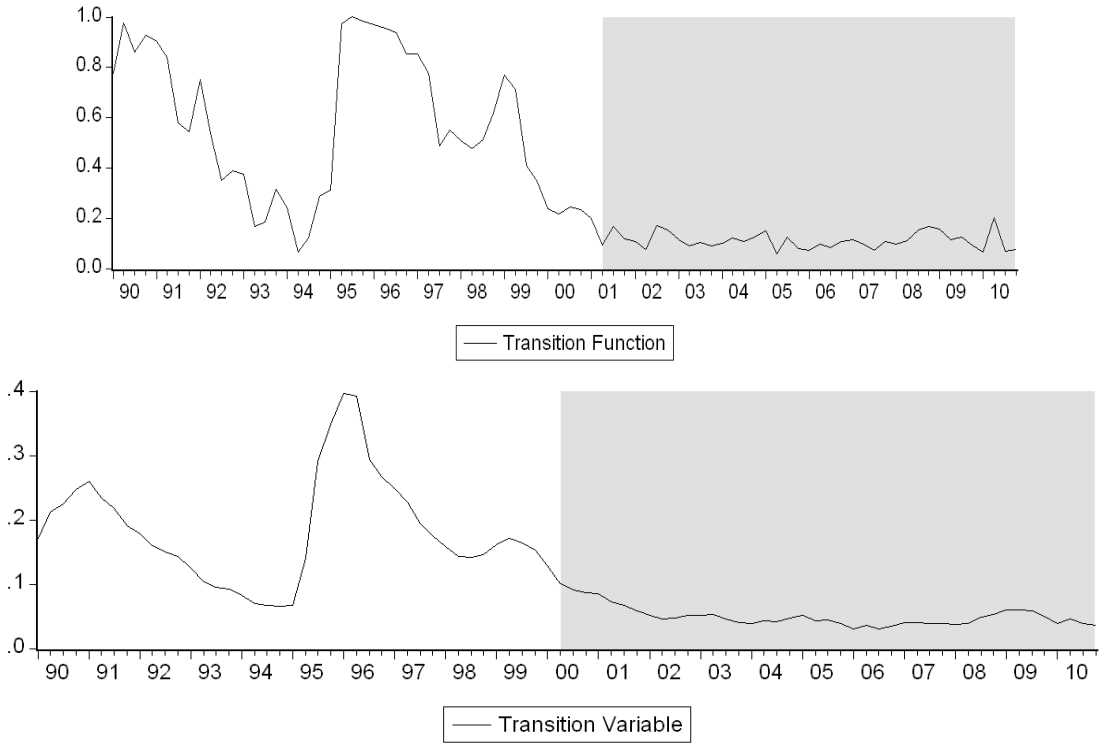
Linear Part *G = 0*						
Constant	0.007	(0.00)	0.004	(0.41)	0.006	(0.08)
π_{t-1}	0.75	(0.00)	0.79	(0.00)	0.91	(0.00)
π_{t-2}	-0.29	(0.00)	--		--	
π_{t-3}	--		--		--	
π_{t-4}	--		--		-0.12	(0.03)
Δe_t	0.28	(0.00)	0.02	(0.00)	0.12	(0.05)
Δe_{t-1}	--		0.05	(0.00)	--	
Δe_{t-2}	0.10	(0.00)	--		0.04	(0.02)
Δe_{t-3}	--		--		--	
Δe_{t-4}	--		--		--	
Δmc_t	0.05	(0.00)	0.006	(0.00)	--	
Δmc_{t-1}	--		--		0.003	(0.02)
Δmc_{t-2}	--		--		--	
Δmc_{t-3}	--		--			
Δmc_{t-4}	--		--		--	
Δy_t	--		--		0.003	(0.00)
Δy_{t-1}	0.003	(0.00)	--		--	
Δy_{t-2}	--		--		--	
Δy_{t-3}	--		0.003	(0.04)	--	
Δy_{t-4}	--		--		--	
Non Linear Part *G = 1*						
Constant	0.11	(0.01)	0.06	(0.02)	0.007	(0.00)
Δe_t	0.11	(0.05)	0.16	(0.00)	0.79	(0.00)
Δe_{t-1}	-0.34	(0.00)	0.04	(0.00)	-0.75	(0.00)
Δe_{t-2}	0.44	(0.00)	-0.07	(0.00)	--	
Δe_{t-3}	--		-0.08	(0.00)	--	
Δe_{t-4}	--		--		--	
Adj. R^2	0.99		0.96		0.98	
AIC	-9.46		-7.23		-6.60	
JB	2.80	(0.25)	5.82	(0.07)	5.85	(0.07)
LM AR_4	0.43	(0.78)	0.20	(0.94)	2.25	(0.07)
LM $ARCH_4$	5.56	(0.24)	0.72	(0.58)	0.24	(0.92)
LM $_{\text{Parameter Con.}}$	1.16	(0.31)	1.17	(0.32)	0.71	(0.74)
LM $_{\text{RNL}}$	0.66	(0.88)	0.95	(0.51)	0.75	(0.70)

Note: Numbers in parentheses are p-values. R^2 denotes the coefficient of determination; AIC is the Akaike Information Criterion. The following rows corresponds to the misspecification tests: JB is the Jarque-Bera normality test, $LMAR_4$ is the LM test of no error autocorrelation up to forth order, $LMARCH_4$ is the LM test of no ARCH effects up to forth order, LM_{PC} is the LM test of parameter constancy and LM_{NRNL} is the LM test of no remaining non-linearity.

For each country, we argue that high pass through environment may be explained by high inflation and previous exchange rate regimes. Over the last two decades Mexico has experienced large exchange rate depreciations and high inflation. The twin balance-of-payments and financial crises that

hit Mexico in 1994–95 forced the country to abandon the exchange rate peg (Sidaoui and Ramos-Francia, 2008).

Figure 2: Transition Variable (π_{t-1}) and Estimated Transition Function for Mexico



Therefore, the transition function in Figure 2 is higher, i.e., closer to 1, basically after the collapse of the peso in 1995, and around the Russian and Brazilian crises, in late 1998 and the beginning of 1999, which is consistent with our initial hypothesis that ERPT should be higher during periods of high inflation environment. After Banco de Mexico adopting IT and flexible exchange rate regime in 1999, inflation rates declined and transition function is lower as presented in Figure 2.

The exchange rate is known to have a major role in determining inflation dynamics in Israel. From the onset of the stabilization program (1985) and until 1994, exchange rate played a significant role as a nominal anchor and high inflation encouraged the indexation of prices to exchange rates in many sectors of the economy (Eckstein and Soffer, 2008).

Figure 3: Transition Variable (π_{t-1}) and Estimated Transition Function for Israel

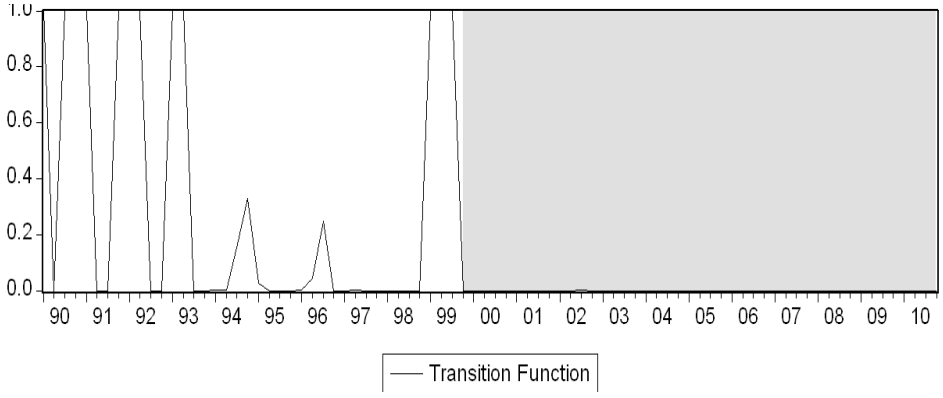
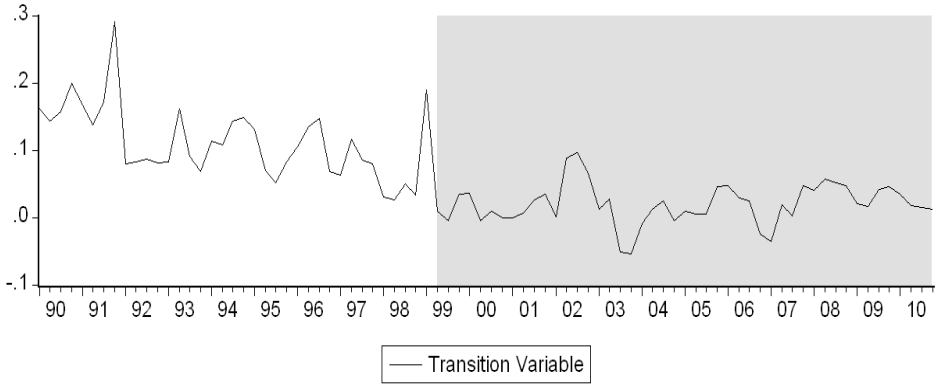


Figure 3: Transition Variable (π_{t-1}) and Estimated Transition Function for Israel- continued



Israel was declared an exchange rate band of %3 width in 1989 in order to maintain a stable and reliable monetary regime. In 1994 the Bank of Israel began publishing its monetary interest rate month by month, and IT was officially declared. After adopting IT, ERPT is lowered as shown in Figure 3, except the years 1998 and 1999 when the Brazil and Russian financial crises occurred. Since 1998, the Bank of Israel has not intervened in the foreign exchange rate market and with adopting IT the band was officially abolished in 2005 (see Elkayam, 2003 and Eckstein and Soffer, 2008).

Similarly, during the 1990's Turkish economy has been plagued by high and persistent inflation under managed and crawling peg exchange rate regimes and the exchange rate provides a nominal anchor for monetary policy. This implied a strong indexation of exchange rates to prices and increased the role of exchange rates in price setting behaviour (Kara and Öğünç, 2008).

In Turkey, the ERPT declined in 2000 with the implementation of exchange rate based stabilization program which was adopted in December 1999.The program ended following November 2000 and February 2001 financial crisis and ERPT has increased. After these crises, a new strengthened stabilization program has implemented under flexible exchange rate regime in 2001 and Central Bank of Republic of Turkey adopted IT in 2002. Hence the ERPT diminished after 2003 where the inflation environment has become stable as shown in Figure 4.

Figure 4: Transition Variable (π_{t-3}) and Estimated Transition Function for Turkey

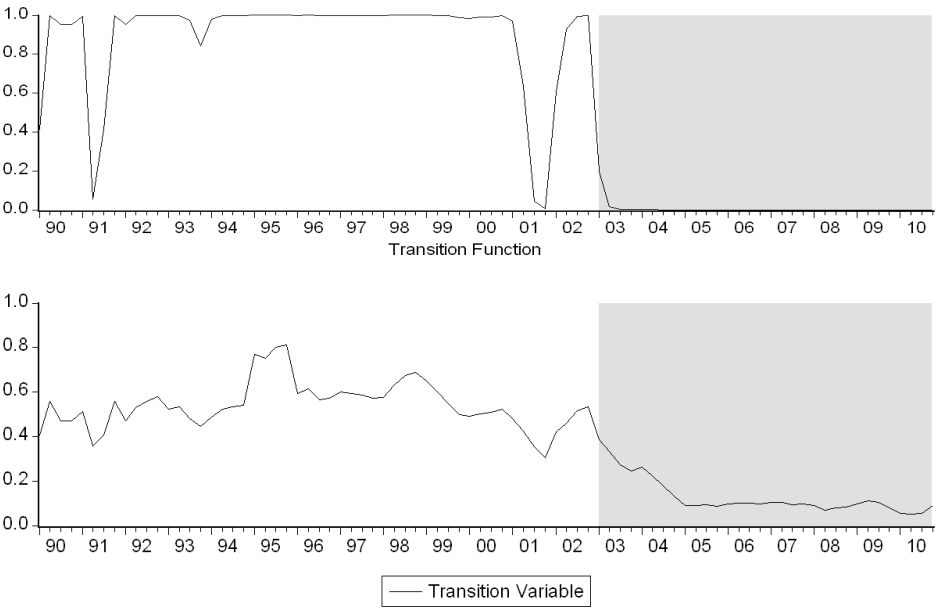


Table 3 presents the short and long run elasticity of ERPT into CPI inflation in Mexico, Israel and Turkey. We observe that ERPT declined substantially during the recent global disinflation period and our estimation results provide strong support for the Taylor's hypothesis. In Mexico, while short run ERPT is equal to 0.39 in the high inflation regime, it is equal to 0.28 in low inflation environment. Similarly, in Israel short run ERPT decreased from 0.18 to 0.02 and for Turkish economy the ERPT decreased from 0.91 to 0.12. Likewise, the long run ERPT elasticises for these countries are diminished. For Mexico, Israel and Turkey, it is decreased from 0.89 to 0.61, 0.57 to 0.33 and 0.95 to 0.76, respectively. Short run pass through is low in these countries because as stated in Edwards (2006) the low pass through in the short run indicates that there has been an increase in the short run effectiveness of the nominal exchange rate.

Table 3: Estimated ERPT Elasticises from the LSTR Model with $s_t = \pi_{t-i}$

	Mexico	**Israel**	**Turkey**
Trans. Variable (s_t)	π_{t-1}	π_{t-1}	π_{t-3}
Threshold (c)	0.14 (0.00)	0.16 (0.00)	0.41 (0.00)
Speed of Transition (γ)	1.96 (0.00)	8.14 (0.00)	11.24 (0.06)
G = 0			
SR ERPT	0.28	0.02	0.12
LR ERPT	0.61	0.33	0.76
G = 1			
SR ERPT	0.39	0.18	0.91
LR ERPT	0.89	0.57	0.95

Note: Table reports elasticises of ERPT into CPI inflation from LSTR models. Numbers in parentheses are p-values of estimates.

The difference between the short and long run ERPT elasticity for Israel is attributed to the home rental contracts which are indexed to the dollar exchange rate (see, Eckstein and Soffer, 2008). Different from Mexico and Israel because the high weight of imported goods in the factors of production (see, Başçı et al. 2008) and still relatively high level and persistent behaviour of inflation in Turkish economy , Turkey has the highest long run ERPT elasticises among these countries.

As a result, our study indicates that ERPT is a non-linear function of the importing country inflation regime also the high inflation environment and the exchange rate regime might be accepted as the important determinants of ERPT in these countries. Based on our findings, we consider that adopting IT also might have been effective in weakening the pass through. Under IT, flexible exchange rate affords the decline in the indexation of prices to exchange rates and inflation target provides a nominal anchor in price setting behaviour and expectation formation.

5. Conclusion

In this paper we have examined the ERPT into inflation for three EMEs, namely Mexico, Israel and Turkey. Our empirical results show that decline in ERPT in recent years is due to a change in the behaviour of inflation and ERPT is lower in low inflation environment and moving to a stable macroeconomic environment provides a weaker ERPT as suggested by Taylor (2000). Moreover, the ERPT for these three EMEs contain a significant LSTR component which is driven by the lagged values of the12 month change of CPI. Our findings are quite similar for these countries, but because of the high weight of imported goods in the factors of production in Turkish economy, the long run ERPT is the highest in Turkey among these countries. All in all, we argue that adopting IT and flexible exchange rate regime is one of the important reasons explaining the decline in ERPT.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Performance-Flow Relationship and Spillover Effect in Taiwan Fund Market

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Abstract

This paper investigates the fund performance-flow relationship and spillover effect in the Taiwan mutual fund market. By examining the monthly data of open-ended domestic equity funds from Jan. 2001 to June 2010, we find a similar U-shaped fund performance-flow relationship, which is a little different from the convex-shaped results found in the U.S. fund data. Our results show that fund investors chase past winners but also redeem their cash flows from the past losers. Fund flows depend not only on the prior fund ranking within the same category but also on the fund's position within the same fund family. In addition, a stellar fund attracts significant positive cash flows to its fund assets. However, we find a crowding-out effect rather than a spillover effect from other stellar funds within the same fund family. The total net asset of a fund that has worse management performance than the top-performing funds would be crowded out if there are other best performers in the same fund family.

Keywords: Mutual funds, fund performance, fund flow, spillover effect.
JEL Classification Codes: G11, G23

1. Introduction

Recently, several studies have considered the relationship between fund performance and fund flows in order to enable a better understanding of how investors behave relative to their portfolios' performances. It is well documented that mutual-fund investors respond asymmetrically to past fund performance (Ippolito, 1992; Gruber, 1996; Chevalier & Ellison, 1997; Sirri & Tufano, 1998; Goetzmann & Peles, 1997; Del Guercio & Tkac, 2002), with the relationship between inflows and past performance being convex. These studies find that past fund performance is a decisive factor for investor fund flows and that fund investors flock into a recently high-performing fund but fail to flee from past losers. Kempf and Ruenzi (2008) report that fund inflows depend not only on the relative position of a fund in its market segment but also on the relative position of a fund in its family.

Studies that have examined non-U.S. markets are relatively few in number, and the empirical findings have been inconsistent with the U.S. fund results. Benson, Tang, and Tutticci (2008) find some evidence in Australian open-ended equity funds that the top-performing funds within a family receive greater cash flows. Rajeeva and Vijay (2007) show that Canadian investors neither chase winners nor hang on to losing funds. While investors do allocate funds based on past performance, the allocations do not disproportionately favor star funds. Poor performers, however, experience significant fund withdrawals. In addition to the asymmetric fund performance-flow relationship, the fund spillover effect also has been widely studied. The empirical results of the related literature show that a top-performing fund has a spillover effect on the other member funds within the same fund complex (Khorana & Servaes, 1999; Ivkovic, 2001; Massa, 2003; Nanda, Wang, & Zheng, 2003; Huij & Verbeek, 2007).

Previous work on the Taiwan market is relatively limited. Shu, Yeh, and Yamada (2002) investigate the behavior of Taiwan mutual-fund investors in terms of fund performance and fund flows. They find that fund flows are generally sensitive to past returns with longer than six-month holding periods, especially for the high-performing funds in the top quartile. Yu and Tzeng (2003) explore the spillover effect among Taiwan funds within the same fund family. The results show that there is a crowding-out effect due to other worse-performing funds in the same fund family, while there is no significant spillover effect due to the family's best-performing fund. In addition, Lin (2007) examines both the fund performance-flow relationship and the spillover effect in the Taiwan mutual-fund industry. The results report an insignificant, convex performance-flow relationship and an insignificant spillover effect in the domestic equity funds.

Though many studies have been done on the performance-flow relationship of U.S. equity funds, few studies have reported on the Taiwan fund market. Among the studies of Taiwan mutual funds, the empirical results seem to be mixed, and they could be more convincing if their sample periods were longer. In addition, intuitively it would be better to use high-frequency data to examine the fund performance-flow relationship since monthly data cover more information than yearly data and Taiwan fund investors are short-term traders.[1] Finally, the study of the fund performance-flow relationship not only has practical importance but also enables us to better understand the behavior of fund investors. Therefore, we use monthly data to examine whether investors' cash inflow relates to past fund performances and to catch more information about the fund investors' reactions to fund flows.

In this article, five main research questions are raised. First, we would like to examine whether the fund performance-flow relationship is convex-shaped in the Taiwan mutual–fund market. Do fund investors chase past winners while not withdrawing money from past losers? Second, does a fund's position in its fund family relate to its fund flows? Third, does a top fund lead to significant cash inflows to its fund management asset? Fourth, we would like to investigate whether a top-performing fund brings more cash inflow to other member funds within the same fund family (spillover effect). Finally, since fund flows may be affected by other factors such as economics or politics, we use the market rate of return as a proxy for the two factors to examine whether the growth of fund flows is related to the current performance of the stock market.

A piece-wise linear-regression model is employed in this paper to test the performance-flow relationship for Taiwan open-ended domestic equity funds. We find that a similar U-shaped performance-flow relationship exists in the fund market when we use monthly fund data and fund performances over a one-month holding period. Equity fund investors proportionately flock into higher-performing funds and flee from lower-performing funds at nearly the same rate, which is a little different from the U.S. fund studies, which found that fund investors respond asymmetrically to past fund performance, with the relationship between inflows and past performance being convex. In addition, a fund attracts significant cash inflows to its management assets if it is the top performer within its segment in the prior month. Moreover, a fund that has relatively higher performance than the other member funds in its family attracts more cash inflow to its management assets. We also find a crowding-out effect instead of a positive spillover effect from a stellar fund in the fund market. Finally, the fund flow is found to be negatively related to the past one-month market rate of return.

The remainder of this paper is arranged as follows. Section 2 introduces the data, and Section 3 describes the empirical methodology. Section 4 explains the empirical results, and Section 5 presents the conclusions.

2. Data

2.1. Research Design for Fund Performance-Flow Relationship

The primary data sources are the 174 open-ended, domestic equity mutual funds and the 39 fund families from the *Taiwan Economic Journal* (TEJ) data bank for the period from January 2001 to June 2010. There are seven fund categories in our sample: (1) Common Equity Fund, (2) Medium-Small Capital Fund, (3) High-Tech Fund, (4) Value Stocks Fund, (5) Theme Fund, (6) Taiwan Enterprise Fund, and (7) OTC Equity Fund. For each fund, the database contains fund monthly returns, monthly total net assets under management, and annual fund characteristics (e.g., expense ratio and starting date of the fund).

In order to minimize the survivorship bias proposed by Brown et al. (1992), all of the funds available that existed during the sample period are included in the data set, and only the funds with less than 6 months of monthly data are eliminated. The resulting base sample has a total 172 equity funds (representing over 95% of the total net assets (TNA) of Taiwan domestic equity funds), 38 fund companies, 7 fund categories, and approximately 16,982 fund-month observations over the sample period.

2.2. Proxy/Measurements for Fund Flow and Fund Performance

2.2.1. Fund Flow

For each member fund, new money is defined to be the dollar change in *TNA*, net of price appreciation in the fund assets. Normalizing the new money by *TNA* at the beginning of the month gives a measure for new money growth (Chevalier & Ellison, 1997; Sirri & Tufano, 1998) as follows:

$$Flows_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t})}{TNA_{i,t-1}} \quad , \tag{1}$$

where $TNA_{i,t}$ represents the monthly total assets of fund i at time t and $R_{i,t}$ represents the monthly return of fund i during month t.

We also calculate the overall net management assets of a fund company (*STNA*) by summing up the funds' total net assets of all domestic equity funds within the same company. We then calculate the growth rate of the gross net management assets of a fund company (*GSTNA*) as follows:

$$GSTNA_t = \frac{STNA_t - STNA_{t-1}}{STNA_{t-1}} \quad , \tag{2}$$

where $STNA_t$ represents the gross net management assets of a fund company at the end of month t, which we use as a control for company-level flows.

2.2.2. Fund Performance

Following Sirri and Tufano (1998), a fund's raw return is used as a performance measure because influential fund-listing providers such as Morningstar and much of the financial press normally report fund performances in terms of rudimentary performance measures such as historical returns, return rankings relative to other funds with a similar objective, and market-adjusted returns.

2.2.3. Fund Fee Ratio

Unlike U.S. mutual funds that have multiple classes of the same fund, there is only one fund class for equity funds in Taiwan. Transaction cost includes brokerage fees and stock transaction tax. Total fees include management fees, custodian fees, and other fees. The fund fee ratio is defined as

$$Fee\ ratio_{i,t} = \frac{transaction\ \text{cost}_{i,t} + total\ \ fee_{i,t}}{TNA_{i,t}} \quad . \tag{3}$$

2.3. Data Description

Table 1 shows the summary statistics of fund monthly data for the test of the fund performance-flow relationship from January 2001 to June 2010. The average fund in the sample period has monthly total net assets of NTD1, 699 million, charges 0.32% in total fee ratio, and is 7.79 years old. The average fund company has 3.5 domestic equity funds managing monthly assets of NTD10,931 million and is 12.47 years old. The percentage of the monthly observations for each fund category in the sample data shows that the highest product concentrations in the Taiwan fund companies are in common-stock funds (53.40%) and high-tech funds (21.07%).

Table 1: Descriptive Statistics of Data

Variable	N	Mean	Std. Dev.	Minimum	Maximum
Monthly Return (%)	16,982	0.8643	8.3916	-27.7998	45.2442
Fee Ratio (%)	16,982	0.3165	0.1457	0.0330	3.9269
TNA (NT$1,000)	16,982	1,699,111	1,927,685	24,322	22,522,201
Age	16,982	7.79	4.41	0.07	24.50
Fund Company Age	16,982	12.47	5.42	0.66	34.16
STNA (NT$1,000)	16,982	10,931,706	9,577,739	199,987	64,396,742
MKTR	16,982	0.6422	7.6103	-19.3483	25.2603

1) This table displays descriptive statistics data of fund monthly sample data from January 2001 to June 2010.

3. Methodology

3.1. Research Model for the Fund Performance-Flow Relationship

To explore the relationship between fund performance and fund flow, we divide the past fund rankings into five quintiles to explore whether there is an asymmetric performance-flow relationship in high-ranking and low-ranking groups after controlling for other company characteristics such as fund fees, fund age, fund size, past fund flow, and total management assets. The following piece-wise linear-regression model is employed:

$$\begin{aligned} Flows_{i,t} = {} & \gamma_0 + \gamma_1 \times Low_{i,t-1} + \gamma_2 \times Mid_{i,t-1} + \gamma_3 \times High_{i,t-1} + \gamma_4 \times Fee_{i,t-1} \\ & + \gamma_5 \times \ln(TNA_{i,t-1}) + \gamma_6 \times \ln(Age_{i,t-1}) + \gamma_7 \times GSTNA_{i,t} + \gamma_8 \times D1_{i,t-1} + \\ & + \gamma_9 \times D2_{i,t-1} + \gamma_{10} \times MKTR_t + \gamma_{11} \times FamRank_{i,t-1} + \gamma_{12} \times Flow_{i,t-1} + \varepsilon_{i,t} \ , \end{aligned} \tag{4}$$

where $Flow_{i,t}$ represents the net percentage growth of fund i in month t; $Low_{i,t-1}$, $Mid_{i,t-1}$, and $High_{i,t-1}$ are the fractionally ranked performances of funds in the bottom quintile, the middle three quintiles, and the top quintile, respectively, based on the raw returns for the past 1-month holding period within the same category; $Fee_{i,t-1}$ is the fee ratio of fund i in month t-1; $\ln(TNA_{i,t-1})$ is the log of the total net assets of fund i in month t-1; $\ln(Age_{i,t-1})$ is the log of the age of fund i in month t-1; $GSTNA_{i,t}$ is the growth rate of total company management assets for domestic equity funds in month t; $D1_{i,t-1}$ is a dummy variable that takes the value 1 if fund i ranks in the top 3 of its peer funds within the same category in the prior month, and 0 otherwise; $D2_{i,t-1}$ is a dummy variable that takes the value 1 if there is at least one member fund j within the same company that ranks in the top 3 of its peer funds within the same category, and 0 otherwise; $MKTR_t$ is the monthly rate of return of the Taiwan Stock Exchange Capitalization Weighted Stock Index (TAIEX); $FamRank_{i,t-1}$ is the ranking position of a fund within its fund company in month t-1; and $Flow_{i,t-1}$ represents the net percentage growth of fund assets for fund i in month t-1.

Equation (4) is estimated by using a method proposed by Fama and MacBeth (1973) that has also been used by Sirri and Tufano (1998) for the U.S. data. Following this method, we perform cross-

sectional regression on fund flows for each month and take the average of each coefficient. We have a total of 114 cross-sectional regressions throughout the 9.5-year observation period. A pooled regression method would underestimate the standard errors and over-estimate the t-values (Sirri & Tufano 1998, p. 1597).

In addition to the Fama-MacBeth method, the unbalanced panel regression analysis is also used for comparison. The application of the panel data regression model can solve the problem of parameter estimator inefficiency caused by pooled OLS analysis of the data, with the pooling of observations on a cross-section of entities over several time periods.

4. Empirical Results

4.1. Regression Results

Table 2 reports the coefficient estimates of Eq. (4), by both the Fama and MacBeth (1973) procedure and the unbalanced panel-regression analysis. The regression coefficients of models (A), (B), and (C) are estimated by using the data sample with different numbers. Fund companies that have only one domestic equity fund are deleted from the data sample because the variable $FamRank_{i,t-1}$ is added into model (B). Also, the number of observations is decreasing to 15,905 due to the calculation of one-period lag because the variable $Flow_{i,t-1}$ is added into model (C). The left side of Table 2 shows the regression coefficients estimated by using the Fama and MacBeth (1973) procedure, and the right side reports the coefficient results of the one-way fixed-effects model.

As shown in Table 2, the significantly positive coefficients of fund performances within the top quintile (0.1248, 0.1097, and 0.1027) in panel B indicate that fund investors chase past winners, which is consistent with most of the findings of the previous literature. In contrast, the significantly negative coefficients of fund performances within the bottom quintile (-0.0920, -0.1115, and -0.1162) indicate that fund investors flee from past losers, which is not consistent with the asymmetric fund performance-flow relationship of the previous studies.

Our regression results show that fund investors respond symmetrically to past winners and losers at nearly the same rate. However, the coefficients of the middle three quintile performances are positive though not significant. These imply that there exists a similar U-shaped fund performance-flow relationship in the Taiwan fund market, as shown in Fig. 4.1. The results indicate that past fund performance is the decisive factor for investor fund flow and that fund investors not only flock into a recently high-performing fund but also flee from past losers. Compared with the previous findings using U.S. data, Taiwan fund investors tend to sell past losers instead of keeping them too long.

As shown in panel B of Table 2, the previous fund ranking within the same fund family also positively relates to fund flows. The significantly positive coefficients, 0.0185 and 0.0208, indicate that the growth of fund assets increases when the prior monthly ranking among the same fund company rises, which is consistent with the finding of Kempf and Ruenzi (2008). Also, the significantly positive coefficients (0.0124, 0.0138, and 0.0157) of the dummy variable, *D1*, indicate that the growth of fund assets increases if the fund is ranked within the top three performers among the peer funds.

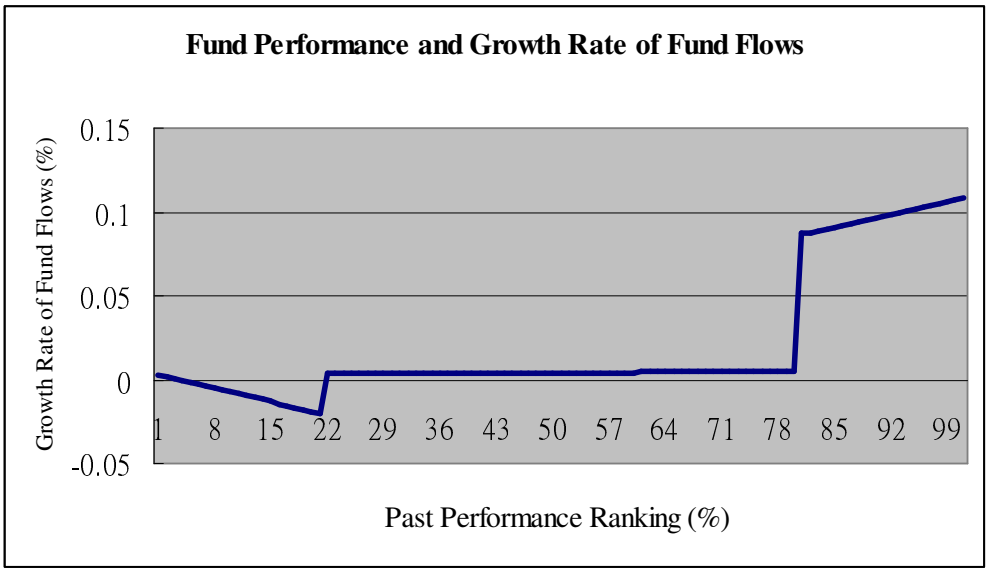
The significantly negative coefficient estimates of $MKTR_t$ show that the growth of fund assets decreases when the concurrent stock market performs well, which is the opposite of what we would expect. This might imply that fund investors may realize the profit and redeem the fund shares because of short trading and the disposition effect (a tendency to sell winners too soon) when the stock market performs well.

However, we do not see a positive spillover effect since the coefficient estimates of *D2* are negative in both panels A and B. The negative spillover effect indicates that a fund's cash flows may decrease when there exist other stellar funds in the same company if its fund performance is not particularly good. In other words, this negative spillover effect could be a crowding-out effect as fund investors actively exploit free fund switching among funds within the same fund company. The fund

investors switch from the fund in which they have invested to a better-performing fund if the fund that they originally hold does not perform as well as the stellar fund.

As shown in Table 2, the regression coefficients of the control variables are significant except for the mixed results of $Fee_{i,t-1}$. Consistent with the empirical results of Sirri and Tufano (1998) for the U.S. data, the concurrent monthly growth of gross net assets under management of a fund company and the fund size of the prior month are positively related to the growth of fund flows, and the log lag TNA is negatively related to the growth of fund flows. On the other hand, the significantly positive coefficients of fund age indicate that old funds have a stronger effect on subsequent fund flow than do young funds, which seems to be inconsistent with the results of Chevalier and Ellison (1997), who found that the fund performance-flow relationship is stronger in young funds than in old funds. Finally, the prior monthly growth of fund flows positively relates to the subsequent monthly growth of fund flows. Panel A of Table 2 exhibits similar results as those in panel B.

Figure 4.1: Relative fund performance and growth rate of fund flows.



This figure shows the relationship between the past fund performance and the growth rate of fund flows for different fund performance-ranking groups (the low-ranking, medium-ranking, and high-ranking groups). The partial effects of past fund performance ranking on the growth rate of fund flows are calculated by holding the other variables constant in Eq. (4).

Table 2: The Effect of Fund Raw Returns on the Growth of Fund Flows

This table reports the coefficient estimates of Eq. (4) by both the Fama and MacBeth (1973) procedure and unbalanced panel-regression analysis. The independent variables include the measure of fractional performance ranking of fund i in the previous month ($Low_{i,t-1}$, $Mid_{i,t-1}$, and $High_{i,t-1}$), which are the fund's fractionally ranked performance on the bottom quintile, the middle three quintiles, and the top quintile in period t-1, respectively; the fee ratio of fund i in the previous month ($Fee_{i,t-1}$); the log of the total net assets in the previous period ($Size_{i,t-1}$); the log of the fund age in period t-1 ($Age_{i,t-1}$); the total net assets under management of a fund company ($GSTNA_t$). $D1_{i,t-1}$ is a dummy variable that takes the value 1 if fund i ranks in the top 3 of its peer funds within the same category in the previous month t-1, and 0 otherwise. $D2_{i,t-1}$ is also a dummy variable that takes the value 1 if there is at least one member fund j within the same company that ranks in the top 3 of its peer funds within the same category, and 0 otherwise. $MKTR_t$ is the monthly rate of return of the Taiwan Stock Exchange Capitalization Weighted Stock Index (TAIEX) in month t. $FamRank_{i,t-1}$ is the ranking position of a fund within its fund company in month t-1. $Flow_{i,t-1}$ represents the net percentage growth of fund assets for fund i in month t-1. To calculate fractional performance ranking, funds are first given a fractional ranking, RK1, from 0 through 1 based on the previous monthly raw return. Then Low, the bottom quintile rank, takes the value Low(RK1, 0.2). Mid, the middle three quintiles, takes the values Min (RK1-Low, 0.6), and High, the top quintile, is RK1-(Low + Mid). The empirical results of F statistics reject the null hypothesis that the fixed-effects parameters are all zero. And the results of the Hausman test suggest that the fixed-effects model is more appropriate. Therefore, the one-way fixed-effects model of the panel regression analysis is adopted in this study.

Variables	A. Coefficient Estimated by the Fama and MacBeth (1973) Procedure						B. Coefficient Estimated by the One-Way Fixed Effects Model					
	(A)	t-value	(B)	t-value	(C)	t-value	(A)	t-value	(B)	t-value	(C)	t-value
$Low_{i,t-1}$	-0.0781	(-0.9063)	-0.1022	(-1.0693)	-0.1038	(-1.034)	-0.0920**	(-2.14)	-0.1115**	(-2.46)	-0.1162***	(-2.59)
$Mid_{i,t-1}$	0.0170**	(2.2018)	0.0047	(0.5268)	0.0040	(0.4122)	0.0156*	(1.73)	0.0068	(0.68)	0.0022	(0.22)
$High_{i,t-1}$	0.1216***	(2.7937)	0.1035**	(2.2506)	0.0899**	(2.0444)	0.1248***	(3.15)	0.1097***	(2.62)	0.1027**	(2.48)
$Fee_{i,t-1}$	-0.0320**	(-2.3560)	-0.0341**	(-2.2278)	-0.0056	(-0.6723)	-0.0238*	(-1.83)	-0.0220	(-1.57)	-0.0250*	(-1.79)
$ln(TNA_{i,t-1})$	-0.0123**	(-2.3228)	-0.0128**	(-2.3032)	-0.0135**	(-2.3881)	-0.0246***	(-9.17)	-0.0265***	(-9.31)	-0.0271***	(-9.56)
$ln(Age_{i,t-1})$	0.0142***	(5.4061)	0.0151***	(4.8692)	0.0118***	(3.7991)	0.0139***	(4.99)	0.0166***	(5.44)	0.0130***	(4.07)
$GSTNA_{i,t}$	0.6952***	(9.3395)	0.6910***	(8.5885)	0.6781***	(8.42810)	0.4302***	(38.62)	0.4052***	(34.48)	0.5921***	(41.94)
$D1_{i,t-1}$	0.0069**	(2.5261)	0.0096***	(3.2890)	0.0093***	(3.2063)	0.0124*	(1.76)	0.0138*	(1.88)	0.0157**	(2.16)
$D2_{i,t-1}$	-0.0079**	(-2.1727)	-0.0052	(-1.4724)	-0.0021	(-0.0021)	-0.0082**	(-2.18)	-0.0051	(-1.30)	-0.0074*	(-1.90)
$MKTR_t$	-0.0692*	(-1.6731)	-0.0687	(-1.6358)	-0.0604*	(-1.6707)	-0.0038***	(-16.85)	-0.0036***	(-15.11)	-0.0054***	(-22.00)
$FamRank_{i,t-1}$			0.0227***	(5.4566)	0.0211***	(4.7407)			0.0185***	(2.69)	0.0208***	(3.06)
$Flow_{i,t-1}$					0.1550***	(5.2388)					0.0572***	(7.59)
F value[a]							1.87 (<.0001)		1.97 (<.0001)		1.71 (<.0001)	
m value[b]							32.14 (<.0004)		41.53 (<.0001)		104.41 (<.0001)	
Adj. R^2	0.3539		0.3303		0.3673		0.1104		0.0979		0.1331	
N	16,810		16,072		15,905		16,810		16,072		15,905	

Notes:

1. F test for no fixed effects.
2. The results of Hausman test show significant m values, which suggest that the null hypothesis of random effects is rejected.
3. The symbols *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

5. Conclusion

This study on the fund performance-flow relationship of Taiwan domestic equity funds suggests a number of interesting findings. First, we find that there exhibits a similar U-shaped relationship between fund performance and fund flow. In other words, not only do fund cash flows chase past high-performing funds but also the poor performers experience significant fund withdrawals. Second, we also find a crowding-out effect instead of a positive spillover effect from a stellar fund in the fund market. Third, the results show that the growth of fund assets is negatively related to the concurrent market rate of return, which might be consistent with the fact that Taiwan investors tend to redeem their investments quickly due to short trading and the disposition effect.

There might be some reasons for explaining the similar U-shaped performance-flow relationship and the crowding-out effect in the Taiwan fund market. First, as a marketing strategy, a fund family usually spotlights past fund performances and promotes the star funds, which may explain why investors buy the winners. This fact is also confirmed by the regression results that a stellar fund can attract large cash inflows into its fund asset. Second, only a small fixed switching fee is charged when investors transfer their investment from a low-performing fund into a better-performing fund within the same fund company. This is different from the result obtained using U.S. fund data, which show that investors in the lower-performing funds tend to hold their investments due to cognitive dissonance and a strong endowment effect (Goetzmann & Peles, 1997). Our results show that investors in past losers in Taiwan are more active in redeeming their investments or engage in fund switching.

Our findings on the performance-flow relationship and the negative spillover effect imply that fund companies that sell high-performing funds and low-performing funds might respond differently to fund flows. Not only fund companies that own stellar funds are able to attract more cash inflow to their total assets under management—a fund company that spotlights its best fund can also increase its fund assets. Furthermore, cash management for a fund manager is important because Taiwan fund investors tend to be short traders. An extension of our study would be to investigate the differences in fund managers' behavior for high-performing and low-performing funds, but we leave this for future research.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Inflation Targeting and Exchange Rate Volatility: The Role of Exchange Rate Regimes

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Abstract

This paper analyzes how the choice of a country's exchange rate regime may influence real exchange rate volatility within and outside the framework of inflation targeting policy. Using system-GMM estimator for a panel of 62 countries covering the period 1985-2009, the results show that among the costs of the adoption of both inflation targeting and flexible exchange rate regimes policies are the increase in the real exchange rate volatility. Moreover, using De facto classification, this paper finds that for developed countries, the mix of inflation targeting and fixed regimes policies are associated with the lowest degree of volatility. For developing countries, the mix of inflation targeting and intermediate regimes policies are most effective preventing real exchange rate volatility. However, the results have no clear tendency by using the De jure classification. We also concluded that, as in the developing countries, the Fear of Floating is also justified in the developed countries.

Keywords: Inflation Targeting, Real Exchange Rate, Exchange Rate Regimes, Two-Step System-GMM Method, Panel Data.
JEL Classification Codes: C33, E31, F31, F41

1. Introduction

Since the end of the Eighties, an increasingly significant number of developed and developing countries chose to follow the example of New Zealand in the adoption of the inflation targeting policy (IT). This increasing popularity of IT, as a new framework of the monetary policy, comes following the failure of the old regimes of the monetary policy. Indeed, the instability observed in the monetary demand, in the Eighties, returned the targeting of monetary mass a very difficult task for the majority of the developed countries. In the Nineties, the reluctance of the majority of developing countries to subordinate an independent monetary policy, whose objective is the anchoring of exchange rate, is explained by the high capital mobility. This encouraged these countries to adopt other arrangements which suppose more flexibility to anchor the exchange rate.

The effect of IT policy on macroeconomic variables, namely inflation and its volatility and the economic growth and its volatility, was the object of a great number of theoretical and empirical work. In contrast, the studies relating to the effect of IT on the exchange rate and its volatility are limited (De Gregorio, Tokman and Valdés, 2005; Edwards, 2006; Rose, 2007; Pontines, 2011).

As many economists have noted, a smooth running of IT policy requires a floating exchange rate system (Mishkin and Savastano, 2001). The interaction between the policy of IT and flexible exchange rate regime can have costs in terms of the increase in the volatility of exchange rate. In their

paper, De Gregorio, Tokman and Valdés (2005) discussed this issue in the context of the Chilean economy (a country with IT). They proved that the volatility of nominal exchange rate in Chile was not higher than in other countries with floating exchange rates of exchange and without IT (non-IT). Baba, Engle, Kraft and Kronerarguez (1990), Berganza and Broto (2012), De. Gregorio and Al (2005), Edwards (2006) and Pontines (2011) show that IT would lead to a higher volatility of exchange rate. Adolfson (2007) noted that the lack of credibility of IT policy can also lead to a high exchange rate volatility. Another result found by Goldstein (2002) indicates that the fact of combining the administered exchange rate regime with IT tends to decrease the volatility of exchange rate. This result confirms the previous conclusion which announces that the free float under IT maximizes the volatility of exchange rate.

The studies of Edwards (2006) and Rose (2007) are considered among the most interesting work that focused on the effect of IT on the volatility of exchange rates. Using the GARCH and EGARCH models, Edwards (2006) concluded that the adoption of IT policy does not have as consequence an increase in the volatility of nominal and real exchange rate. Another very interesting result found by Edwards is that the degree of exchange rate volatility decreased in the IT countries, when the exchange rate regime is controlled. However, the adoption of IT will tend to increase the exchange rate volatility. These results allow us to conclude the important role of the exchange rate regime in the determination of the nature of IT effect on volatility. Thus, they lead us to ask about the exchange rate system that minimizes the volatility of exchange rates within a framework of inflation targeting.

Applying the OLS method, Rose (2007) showed that the volatility of the exchange rate in IT countries is significantly low compared to non-IT countries. However, this conclusion must be analyzed with precaution seen that the empirical results of Rose are most often not-significant. In a recent study, Pontines (2011) used a model of treatment effect to evaluate the behavior of exchange rate volatility under IT. He noted that the volatility of nominal and real exchange rate is lower in IT countries than in non-IT countries. Disaggregating the sample by level of development, Pontines also specified that the developing countries with IT have exchange rate volatility lower than the developing countries without IT. In contrast, he concludes that the volatility of the exchange rate in developed countries has increased. The results of Pontines (2011) show several gaps. Indeed, the choice to carry out a comparative study between countries not having the same characteristics can pose a problem of heterogeneity. Even with these results, one cannot confirm that IT policy is at the origin of the reduction in exchange rate volatility. In their study, Hausmann, Panizza and Rigobonindiquez (2004) showed that the volatility of nominal exchange rates in IT countries did not increase, compared to non-IT countries with floating exchange rate regimes. The study of Choudhri and Hakura (2006), carried out in seven countries, shows that IT does not have as a consequence an increase in volatility of exchange rate. Moreover, the authors emphasize that IT helps reduce the risk of the unexpected shocks by defining a transparent and credible monetary policy.

Despite the controversies and ambiguities of the results of these studies, the issue of the effect of IT on the exchange rate volatility remains always important. During this paper, one will try to reassess the effect of adoption of IT on the real volatility of the exchange rate by determining the role of exchange rate regimes. To do this, one uses the two-step system-GMM estimator of Arellano and Bover (1995) in dynamic panel data models. This method makes it possible to solve the problems of bias and simultaneity. Basing on the idea that the IT policy is defined according to several factors, the GMM technique thus allows to take into account the problem of endogeneity of IT variable (Brito and Bystedt, 2010).

2. Data and Methodology

Our data are annual covering the period from 1985 to 2009 for a panel of 62 developed and developing countries. Our sample includes 27 IT countries, including 14 developing and 13 developed countries (see table 1 below), and 35 non-IT countries, including 18 developing and 17 developed countries (see table 2 below), which are also called country of control. The choice of these countries of control is mainly based on the empirical literature on inflation targeting (Ball and Sheridan, 2005; Batini and Laxton, 2007; Mishkin and Schmidt-Hebbel, 2007; Gonçalves and Salles, 2008; Lin and Ye, 2009).

Table 1: Author's IT sample: Years of inflation targeting adoption

Developing countries		Developed countries	
IT countries	**Years of IT adoption**	**IT countries**	**Years of IT adoption**
Brasil	1999	Australia	1993
Chile	1999	Canada	1991
Colombia	1999	Czech Rep.	1997
Guatemala	2005	Finland*	1993
Hungary	2001	Iceland	2001
Indonesia	2005	Israel	1997
Mexico	2001	South Korea	2001
Peru	2002	New Zealand	1990
Philippines	2002	Norway	2001
Poland	1998	Slovak Rep*.	2005
Romania	2005	Spain*	1995
South Africa	2000	Sweden	1993
Thailand	2000	United Kingdom	1992
Turkey	2006		

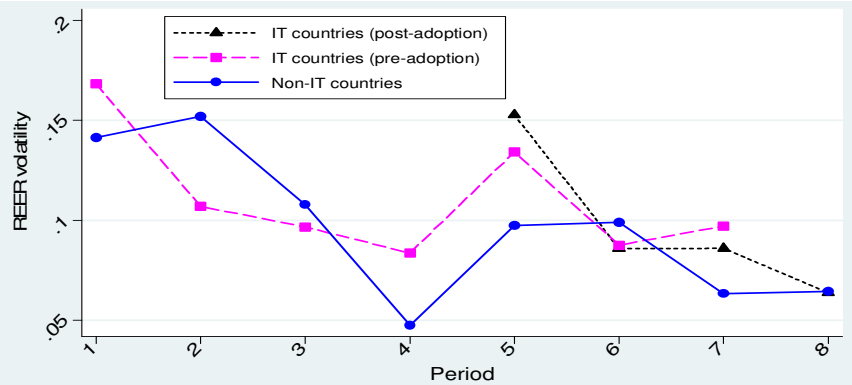
Notes: * inflation targeting policy is abandoned by Spain and Finland in 1999 (date of the euro adoption) and by Slovak republic in 2009.
Sources: Roger (2009).

Table 2: Author's Non-IT sample

Non-IT Developing countries		Non-IT Developed countries	
Algeria	Egypt	Austria	Italy
Argentina	India	Belgium	Japan
Belize	Malaysia	Cyprus	Luxembourg
Bolivia	Morocco	Denmark	Netherlands
Bulgaria	Pakistan	France	Portugal
Costa Rica	Paraguay	Germany	Singapore
Dominica	Trinidad and Tobago	Greece	Switzerland
Dominican Rep.	Tunisia	Hong Kong	United States
Ecuador	Uruguay	Ireland	

Figs.1 and 2, presented below, respectively describe the time behavior of the average volatility of exchange rate for developing and developed countries. Fig.1 shows that, in periods before IT, the evolution of the average exchange rate volatility is unstable in IT and Non-IT developing countries. But, during the period after IT (starting from the period 5), the average exchange rate volatility in the IT developing countries tends to decrease considerably over time. In addition, lower levels of average volatility are registered in IT developing countries.

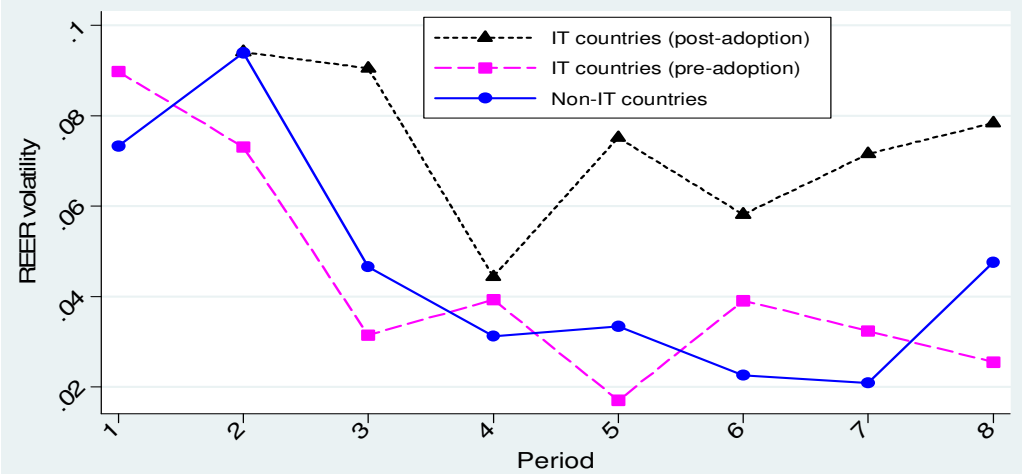
Figure 1: Average exchange rate volatility: Developing countries.



Notes: The total sample is composer of 32 developing countries which are subdivided into 14 countries with IT and 18 countries without IT.

However, Fig.2 proves that, after the adoption of the IT (period 2), the levels of the average exchange rate volatility are higher in IT developed countries compared to Non-IT developed countries. In summary, can one say that IT was the source of the reduction and the increase of mean exchange rate volatility in periods after IT adoption respectively in developing countries and in developed countries?

Figure 2: Average exchange rate volatility: Developed countries.



Notes: The total sample is composer of 30 developed countries which are subdivided into 13 countries with IT and 17 countries without IT.

2.1. Presentation Variables

Basing on the study of Brito and Bystedt (2010), the all variables to be retained in this paper, to detect the IT effect on exchange rate volatility, are: IT, exchange rate regime (defining various types of exchange rate regime), policy-mix (presenting various combinations between IT and exchange rate regimes) and dummy variable for the period of high inflation.

The dependent variable in all equations defined below is the volatility of real effective exchange rate (volreer). As a first step, we must first define and then measure the real effective exchange rate. In a second step, we will measure his volatility.

The empirical literature often used the bilateral real exchange rate as a measure of real exchange rate. In our work, the real effective exchange rate (REER) will be employed[1]. The real effective exchange rate is calculated, in our study, using the consumer price index as a deflator of the nominal exchange rate and using the trade weights partners.

The index of real effective exchange rate ($REER_{t/0}$) is calculated as follows:

$$REER_{t/0} = REER_t * 100 / REER_0 .$$

With $REER_t$ and $REER_0$ are respectively the real effective exchange rate at the year t and at the basic year[2].

Moreover, $REER_{it}$ is given as follows:

$$REER_{it} = \prod_{j=1}^{13}\left[\left(\frac{NER_{(\$/j),t}}{NER_{(\$/i),t}}\right)*\left(\frac{CPI_{it}}{CPI_{jt}}\right)\right]^{\alpha_{jt}} \quad \text{With } \alpha_{jt} = \frac{X_{jt}+M_{jt}}{\sum_{j=1}^{13}\left(X_{jt}+M_{jt}\right)}$$

[1] The choice of REER is explained by the fact that it measures the real value of the domestic currency of a country relative to its main trading partners.

[2] In our work, the base year is 2005 implying that in 2005 the REER is equal to 100.

Where $i = 1..., 62$ is the number of countries in our sample. j[3] $= 1..., 13$ is the number of principal trading partners retained in our study, $t = Q_1 1987..., Q_4 2011$ is the time index, $NER_{(\$/j),t}$ and $NER_{(\$/i),t}$ indicate the nominal exchange rate relative to the American dollar respectively of partner and domestic countries, expressing the number of local currency units per unit of American dollar, CPI_{it} and CPI_{jt} indicate the consumer price index (2005=100) respectively of home country and of partner country, and α_{jt} represents the trade weight of country j relative to home domestic country i at year t, and $\sum_{j=1}^{13} \alpha_{jt} = 1$. It is measured as the sum of exports and imports of home country i relative to partner country j over the sum of exports and the imports of home country i relative to all trading partner countries. The trade weights were obtained from United Nation's Comtrade database and all other data used to measure the REER are from the IMF's International Financial Statistics (IFS).

After defining and measuring the real effective exchange rates, its volatility is measured as the yearly standard deviation of quarterly percentage changes in the natural logarithm of REER.

The independent variables that will be retained in the model of real exchange rate volatility are as follows:

Inflation targeting variable (IT) is a dummy variable measuring the average effect of the inflation targeting policy. It is equal to one if a country i is with inflation targeting regime at the period t, and 0 if not. A significant negative coefficient of IT means that the volatility of the real effective exchange rate is low under inflation targeting, and vice versa.

Hyperinflation variable (hypinf) is a dummy variable that controls the periods whose inflation rates are very high, generally higher than 40%. In most empirical work, the countries which knew periods of high inflation rates are excluded from the sample, although these periods were recorded before the adoption of IT and also although their effect on macroeconomic performance variables is not evident. In our study, the dummy variable "hyperinf" is equal to one if the natural logarithm of inflation rate is higher than 0.40, and 0 if not. A sign significant negative coefficient (positive) of this variable implies that the real exchange rate volatility is low (high) in a period of high inflation rate. The inflation data used to determine a dummy variable of hyperinflation are from the World Economic Outlook (WEO) from the IMF.

ERR variable is a dummy variable capturing the average effect of different types of exchange rate regimes. In the literature, there are two classifications of exchange rate regimes. The first is a De Jure classification, which is based on the official declaration of the countries regarding their exchange rate regimes. The second is a De Facto classification that is based primarily on exchange rate regimes virtually pursued by monetary authorities. In the remainder of our work, we adopt the IMF's De Jure classification[4] and the Reinhart and Rogoff's (RR) De Facto classification[5] (coarse classification). The table 3, presented below, demonstrate how we reduce the six-way IMF's De Jure classification and the 15-way RR De Facto classification (fine classification) to a three-way coarse classification[6].

[3] The list of principal trading partners retained in our work is: Germany, Argentina, Australia, Brazil, Canada, China, Spain, United States, United Kingdom, France, Italy, Japan and Netherlands.

[4] IMF's De Jure classification is annually published by the International Monetary Fund (IMF). See IMF's Annual Report on Exchange Arrangements and Exchange Restrictions, 2006.

[5] See Reinhart and Rogoff (2004).

[6] Contrary to a certain work, we considered, in our study, the managed floating (code 12) as an intermediate exchange rate regime following the classification of Reinhart and Rogoff (2004), Dubas (2009).

Table 3: The fine-to-coarse classification processing

The fine classification			The coarse classification	
Codes		Types of exchange rate regime	Codes	Types of exchange rate regime
RR	IMF			
1	1	No separate legal tender	1	Fixed exchange rate regimes
2	1	No separate legal tender		
3	1	Pre announced horizontal band that is narrower than or equal to +/-2%		
4	1	De facto peg		
5	2	Pre announced crawling peg		
6	2	Pre announced crawling band that is narrower than or equal to +/-2%		
7	2	De factor crawling peg		
8	2	De facto crawling band that is narrower than or equal to +/-2%	2	Intermediate exchange rate regimes
9	3	Pre announced crawling band that is wider than or equal to +/-2%		
10	3	De facto crawling band that is narrower than or equal to +/-5%		
11	3	Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)		
12	3	Managed floating		
13	4	Freely floating	3	Flexible exchange rate regimes
14	5	Freely falling		
15	6	Dual market in which parallel market data is missing.	Dropped	

Sources: Reinhart and Rogoff (2004)

The dummies variables of ERR takes the value one if a country *i* is under the exchange rate regime *j* and zero if not, with *j*=1, 2, 3 (fixed, intermediate and flexible exchange rate regimes). A significantly positive sign (negative) of the coefficient of ERR means that the RER volatility is high (weak) under the estimated ERR.

The interaction variables between IT and EER (or policy-mix[7]) are a dummies variables, which makes it possible to determine the combined effect of IT and each type of exchange rate regimes (De Facto or De Jure). In this study, the mix of IT and ERR policies has three forms: IT and fixed regime policy-mix, IT and intermediate regime policy-mix and IT and flexible regime policy-mix. Each dummy variable is equal to one if a country *i* simultaneously adopted the IT policy and the exchange rate regimes *j* and it is equal to zero if this country adopted IT policy with other exchange rate regimes. A significantly positive sign (negative) of policy mix coefficient means that the exchange rate volatility is high (weak) when the adoption of IT policy combines with the exchange rate regimes *j*.

2.2. Model Specification

The equations to be estimated are as follows:

$$\text{volreer}_{i,t} = \alpha\text{volreer}_{i,t-1} + \beta\text{IT}_{i,t} + \gamma\text{hypinf}_{i,t} + \theta_t + \rho_i + \varepsilon_{i,t} \quad (1)$$

$$volreer_{i,t} = \alpha volreer_{i,t-1} + \beta Fixreg_{i,t} + \delta Intereg_{i,t} + \gamma hypinf_{i,t} + \theta_t + \rho_i + \varepsilon_{i,t} \quad (2)$$

$$volreer_{i,t} = \alpha volreer_{i,t-1} + \beta IT * Fixreg_{i,t} + \delta IT * Intereg_{i,t} + \varphi reg_{i,t} + \gamma hypinf_{i,t} + \theta_t + \rho_i + \varepsilon_{i,t} \quad (3)$$

Where $volreer_{i,t}$ is the volatility of real effective exchange rate, i=1,2..., N is a country index, t=1,2..., T is a time index, $IT_{i,t}$ is a dummy variable capturing the IT effect, $Fixreg_{i,t}$ is a dummy variable for fixed exchange rate regime, $\text{Intereg}_{i,t}$ is a dummy variable for intermediate exchange rate regime, $IT * Fixreg_{i,t}$ is a dummy variable for the IT and fixed regime policy mix, $\text{IT*Intereg}_{i,t}$ is a dummy variable for the IT and intermediate regime policy mix, $reg_{i,t}$ is a dummy variable for the all regimes without IT policy, $\text{hypinf}_{i,t}$ is a dummy variable for the periods when the inflation rates are

[7] In the literature, the policy mix is defined as an optimal articulation of economic policies namely monetary and fiscal policies. In our work, the policy mix will be defined as the combination of monetary and exchange rate regime policies.

higher than 40%, θ_t is a dummy variable for a time trend, ρ_i is a dummy variable for each country *i* and $\varepsilon_{i,t}$ corresponds to the error term

In the first equation, we try to determine the effect of IT on the volatility of real exchange rate. To find out, we present a dynamic model that describes the volatility of the exchange rate in function of IT and that takes into account the periods of hyperinflation and that integrates individual and temporal effects.β is our interest coefficient, which shows the effect on exchange rate volatility of IT policy. Indeed, a significantly positive sign (negative) of β implies that the RER volatility is higher (weak) under IT regime.

In the second equation, we model the relationship between RER volatility and ERR. From this model, we try to discuss the choice of ERR and implications for the limiting of RER volatility, without taking into consideration the framework of IT policy. According to equation (2), the flexible exchange rate regime will be used as our reference regime to which the other ERR will be compared. Positive (negative) sign of β or δ implies that the real volatility of exchange rate under a fixed or intermediate exchange rate regime is higher (lower) than under a flexible exchange rate regime.

The third equation have as object to determine the optimal policy mix of IT and ERR, which is able to limit the real volatility of exchange rates. As in the equation (2), the mix of IT and Flexible ERR policies will be employed as the reference policy mix. A positive (negative) sign of β, δ and φ eans that the RER volatility is higher under respectively IT-fixed regime policy mix, IT-intermediate regime policy mix and any ERR without IT policy than under IT-flexible regime policy mix.

The various equations presented above will be estimated by two-step system GMM method of Arellano and Bover (1995) and Blundell and Bond (1998). This technique assumes that the number of periods is sufficiently lower than the number of countries. For that, we grouped the data into eight periods of three years[8]. The choice to arrange the data by three years is based mainly on the nature of the variables used in various equations (dummy variables). When we are in the presence of variables that measure exchange rate regimes and IT, one must minimize to the maximum the time interval to capture the maximum of information about these variables (Brito and Bystedt, 2010).

The validity of our estimates by "two-step system-GMM" method requires the failure to reject the null hypothesis of the three tests: serial correlation test, Hansen's overidentification test (Hansen J statistic) and difference-in-Hansen C test. We perform the autocorrelation test of Arellano and Bond (1995) to check the absence of second order serial correlation of the term error (null assumption). While, The Hansen J test is a test of overidentification of the restrictions. In other words, we verify the overall validity of the instruments. The null hypothesis of this test assumes that the lagged variables are valid as instruments. The difference-in-Hansen C test is a test of orthogonality of additional moment conditions (exogeneity test of one or more instruments).

3. Results and Discussions

The different estimations of equations 1, 2 and 3 respectively are exposed in tables 4, 5 and 6. According to these tables, the various tests of specification show that our model is identified for the three samples. Firstly, the results of test of Arellano and Bond (1995) fail to reject the null hypothesis of the absence of second order autocorrelation of the error term. Then, the failure to reject the null hypothesis of the Hansen test of overidentification restrictions implies the validity to use the lagged variables as instruments. Therefore, these instruments are strongly exogenous. Finally, the null hypothesis of validity of the additional moment conditions is not rejected by the differences-in-Hansen test implying that the additional moment conditions are orthogonal.

[8] These periods are: 1985-1987, 1988-1990, 1991-1993, 1994-1996, 1997-1999, 2000-2002, 2003-2005, 2006-2009.

3.1. Real Exchange Rate Volatility and the Effect of Inflation Targeting Policy

In order to determine the effect of IT on real exchange rate volatility, we estimated the equation (1) through two-step system-GMM method over eight periods of three years from 1985 until 2009. Our estimations are determined for three samples. The results of the estimates are exposed in table 4 (see below).

According to table 4, the various tests of specifications show that our model is identified for the three samples. Firstly, the results of test of Arellano and Bond (1995) fail to reject the null hypothesis of the absence of second order autocorrelation of the error term. Then, the failure to reject the null hypothesis of the Hansen test of overidentification restrictions implies the validity to use the lagged variables as instruments. Therefore, these instruments are strongly exogenous. Finally, the null hypothesis of validity of the additional moment conditions is not rejected by the differences-in-Hansen test implying that the additional moment conditions are orthogonal.

The three columns of table 4 represent the estimates of the equation (1) respectively for the total of the sample, developing countries and developed countries. The results show that the estimated coefficient of a dummy variable of IT (*IT)* is significantly positive for the total of the sample and developed countries. However, it is positive also for the developing countries, but it is not significant. This implies that the adoption of IT is generally associated with an increased level of the average volatility of real exchange rate, in particular for the developed countries. For developing countries, IT policy does not have, on average, an effect on real exchange rate volatility. In other words, there is not, on average, fundamental differences between volatilities in IT and non-IT developing countries. Further, there are no differences between the levels of volatility before and after IT adoption dates in IT developing countries.

Table 4: Real exchange rate volatility and the effect of inflation targeting

Dependent variable: REER Volatility (volreer)			
	Total sample	**Developing countries**	**Developed countries**
Volreer $_{t-1}$	-0.0142 (-0.18)	0.0092 (0.08)	-0.0653 (-0.67)
IT	0.0269 (2.61)**	0.0129 (0.74)	0.0392 (3.34)***
Hypinf	0.0685 (1.44)	0.0684 (1.11)	(dropped)[a]
Constant	0.0479 (6.79)***	0.0526 (3.84)***	0.0367 (3.66)***
AR(2) test	-0.52 [0.601]	-0.50 [0.618]	1.04 [0.298]
Hansen J test	12.86 [0.379]	9.13 [0.692]	7.65 [0.265]
Difference-in-Hansen C test	0.25 [0.883]	0.36 [0.837]	1.81 [0.178]
F-statistic	7.62 [0.000]***	4.71 [0.001]***	7.07 [0.000]***
Observations	422	217	205
Countries	62	32	30
Instruments	22	22	15

Note: *, ** and *** correspond to significance levels at 10%, 5% and 1%, respectively. t-statistics are in parentheses. p-values are in brackets. AR (2) is second-order serial correlation test of Arellano and Bond of correlation. The failure to reject the null hypothesis of this test implies that the error term is not second-order correlated. The Hansen J test is a test of over-identifying restrictions, which tests the overall validity of the instruments (null hypothesis). The Difference-in-Hansen C test checks the exogeneity of the lagged instruments. Reject the null hypothesis of this test implies the endogeneity of lagged instruments.

[a] The hyperinflation variable (hypinf) is dropped due to a problem of collinearity.

We can summarize that, in general, there is a positive relationship between the IT policy and the volatility of real exchange rate. This implies that the real exchange rate is more volatile after the adoption of IT policy. These results are in the same line as those of Berganza and Broto (2012), De Gregorio et al. (2005), Edwards (2006) and Pontines (2011)[9]. Instead, they are also in contrast with the results of Rose (2007) and Pontines (2011) (in the case of developing countries) who conclude that IT tends to reduce the exchange rate volatility because of the credibility gains associated to this monetary policy.

Significance and non-significance of the positive relationship between the real exchange rate volatility and IT respectively for developed and developing countries can be explained by the role of exchange rate regimes. In fact, the majority of developed countries pursues, in practice, a flexible exchange rate regime. Generally, this type of exchange rate regime, which allows free floating exchange rate on the foreign exchange market, leads to a higher exchange rate volatility, especially when it is combined with IT policy. However, developing countries always have fears of this type of exchange rate regime. According to these countries, the flexible exchange rate regime is necessarily associated with high volatility of exchange rate that can degrade their external positions. In the literature, these fears are called "fear of floating" (Calvo and Reinhart, 2002). With the adoption of IT, developing countries have announced that they pursue the flexible exchange rate regime, but in reality they continue to manage their exchange rates not to allow a higher increase in volatility. This means that these countries pursue a De Jure floating policy and De Facto management policy of their exchange rates.

3.2. Exchange Rate Regime and the Minimization of Exchange Rate Volatility

By comparing the effects of different types of exchange rate regimes, we seek to determine the optimal regime in developing and developed countries that minimizes the RER volatility. To do this, we estimated equation (2) through two-step system-GMM estimator. The results are reported in Table 5. Using IMF De Jure classification, columns I, II and III respectively present the estimation results for the total sample, developing countries and developed countries. However, columns IV, V and VI correspond to the results using the De Facto classification of Reinhart and Rogoff (2004). As Table 5 shows, flexible exchange rate regime is used as reference regime.

3.2.1. Results Analyses: De Jure Classification

In the case of total sample, column I shows clearly that the intermediate exchange rate regimes are the optimal regime for minimizing volatility. Indeed, intermediate regimes are associated with lower levels of volatility, as the estimated coefficient is equal to -0.0546. This coefficient means that intermediate regimes decrease the average volatility approximately 5.46% less than flexible regimes (regimes of reference). In addition, we found that fixed regimes are associated with a estimated coefficient of -0.0489. This reflects that fixed regimes tend to reduce the average volatility of approximately 4.89% less than flexible regimes. The two coefficients of dummies variables for fixed and intermediate regimes are statistically significant at a level of 1%.

Disaggregating our sample according to the level of development, column II indicates that the results did not change for developing countries. In fact, intermediate regimes are regimes associated with the lowest levels of RER volatility. This result is derived via the estimated parameter of -0.0635, suggesting 6.35% less RER volatility in intermediate regimes than in flexible regimes. In addition, developing countries with fixed regimes have the lowest average level of volatility compared to flexible regimes, as the estimated parameter on the dummy variable for fixed regimes is approximately -0.447. In terms of minimizing average levels of RER volatility, these results imply that intermediate regimes are the lead, while the regimes fixed and flexible regimes occupy respectively the second and third rank.

[9] Our results are in the same line as that of Pontines (2011), only in the case of developed countries.

Table 5: Real exchange rate volatility and the effect of IT-exchange rate regimes policy mix

Dependent Variable: REER Volatility (volreer)						
	De Jure Classification			De Facto Classification		
	Total Sample	Developing Countries	Developed Countries	Total Sample	Developing Countries	Developed Countries
	I	II	III	IV	V	VI
Volreer t-1	0.0273	0.0467	-0.1105	0.0509	0.0213	-0.0355
	(0.40)	(0.49)	(-0.98)	(0.75)	(0.27)	(-0.27)
Fixreg	-0.0489***	-0.0447**	-0.0339**	-0.0914***	-0.1364***	-0.0287**
	(-3.90)	(-2.21)	(-2.55)	(-2.80)	(-3.16)	(-2.08)
Intereg	-0.0546***	-0.0635***	-0.0297*	-0.0719**	-0.1259***	-0.0066
	(-4.11)	(-3.28)	(-1.95)	(-2.24)	(-2.94)	(-0.43)
Hypinf	0.0516	0.0644	(dropped)	0.0111	0.0165	(dropped)
	(1.49)	(1.38)		(0.17)	(0.19)	
Constant	0.0916***	0.1033***	0.0763***	0.1303***	0.1795***	0.0671***
	(7.79)	(5.37)	(4.87)	(3.91)	(3.77)	(3.66)
AR(2)	-0.28	-0.52	1.13	-0.15	-0.97	1.24
	[0.783]	[0.601]	[0.260]	[0.879]	[0.333]	[0.216]
Hansen J test	11.72	8.31	19.99	16.48	15.91	17.16
	[0.468]	[0.761]	[0.522]	[0.170]	[0.195]	[0.701]
Difference-in-Hansen C test	0.39	1.10	2.09	2.24	4.99*	3.42
	[0.824]	[0.576]	[0.554]	[0.326]	[0.083]	[0.332]
F-statistic	8.98	4.98	8.86	7.96	6.04	8.93
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	406	205	201	418	213	205
Countries	62	32	30	62	32	30
Instruments	23	23	31	23	23	31

See Table 4 for notes. Fixreg variable has not any observations in developing countries. Flexreg is used for identification in the regression.

Concerning the developed countries, column III shows significantly negative parameters on the variables of interest, which are equal to -0.0339 for fixed regimes and to -0.0297 for intermediate regimes. These coefficients mean that fixed and intermediaries regimes tend to decrease the average volatility respectively 3.39% and 2.97% compared to flexible regimes. Therefore, fixed regimes perform the best followed by intermediate regimes, then flexible regimes.

3.2.2. Results Analyses: De Facto Classification

With De Facto classification, the results, presented in columns IV, V and VI (table 4), differ from those with the De jure classification.

For the total sample, column IV indicates that volatility is on average the lowest under fixed regimes, as the estimated coefficient is -0.0914. Intermediate regimes are associated with 7.19% less RER volatility than flexible regimes. Thus, the De facto fixed regimes are on average the best in terms of limiting RER volatility.

In the case of developing countries (column V), the same conclusions are found. This means that the fixed exchange rate regimes perform the RER volatility better than intermediate and flexible regimes. Moreover, we noticed that there are no considerable differences between fixed and intermediate regimes sight that their percentages of minimizing volatility are interesting and close (13.64% for fixed regimes and 12.59% for intermediate regimes).

For developed countries, the column VI shows that fixed regimes significantly decrease the average volatility of the exchange rate approximately 2.87% less than flexible regimes. In addition, the levels of RER volatility in intermediate and flexible regimes are not differed fundamentally as the estimated coefficient is statistically intermediate regimes insignificant.

In summary, IMF's De Jure classification shows that intermediate and fixed regimes are the best in minimizing RER volatility, respectively for developing and developed countries. However,

RR's De Facto classification shows that fixed exchange rate regimes perform the best in terms of limiting the RER volatility, whatever the degree of development in countries. Another result is quite interesting. Indeed, flexible regimes for the most regressions lead to the largest degree of RER volatility in both developing and developed countries.

After studying in a separated regressions the effects of inflation targeting and exchange rate regimes on the RER volatility, we are interested in determining the combined effect of inflation targeting and each type of ERR. In addition, we are interested in determining the optimal choice of IT-ERR policy mix, which leads to the lowest levels of RER volatility.

3.3. IT-ERR Policy Mix and Minimization of RER Volatility

We seek in this part of our empirical analysis to answer the following central question: What is the policy mix that will be associated with the lowest levels of RER volatility?

Using two-step system-GMM estimator, The estimated results of equation (3) are exposed in Table 6. Using IMF De Jure classification, columns I, II and III respectively present the estimation results for the total sample, developing and developed countries. However, columns IV, V and VI correspond to the results using the RR's De Facto classification. As Table 6 shows, the mix of IT and flexible-regimes policies are used as reference policy mix.

3.3.1. Results Analysis: De jure Classification

For the total sample, column I shows that, in periods of IT, intermediate regimes decrease approximately 3.91% the RER volatility than flexible regimes, since the estimated parameter is -0.0391. However, the effects of IT-fixed regimes policy mix are not fundamentally differed from those of IT-flexible regimes policy mix, as the coefficient for IT*Fixreg dummy is not statistically significant. In addition, the parameter for EER (Reg) dummy is statistically significant and negative (-0.042), which implies that, for the IT countries, the ERR before IT tend to decrease 4.20% less RER volatility than flexible regimes after the adoption of IT. For non-IT countries, this result also implies that their RER volatility is the lowest compared to those for IT countries. Two conclusions can be drawn from these results. Firstly, it will not be the best decision to adopt the IT when the adoption of this policy is not a requirement and when the objective of monetary authorities is to minimize the RER volatility. However, when adopting IT policy is a necessity, intermediate regimes can be a solution to attenuate the volatility of the real exchange rate.

For developing countries, the parameters of all dummy variables are statistically insignificant at the 90% level (column II). this result implies that the effect of EER on RER volatility are not fundamentally different in periods before and after the adoption of IT.

In the case of developed countries, any exchange rate regimes without IT (reg) decrease approximately 4.37% less volatility than the mix of IT and flexible regimes policies, as the coefficient on the dummy variable for IT-fixed regimes policy mix is -0.0437 (column III). However, the parameters for both IT-Fixed regimes and IT-intermediate regimes policies mix are statistically insignificant at least at the 90% level.

Table 6: Real exchange rate volatility and the effect of IT-exchange rate regimes policy mix: RR's De Facto classification

Dependent variable: REER volatility (volreer)						
	De Jure Classification			De Facto Classification		
	Total Sample	Developing Countries	Developed Countries	Total Sample	Developing Countries	Developed Countries
	I	II	III	IV	V	VI
Volreer $_{t-1}$	0.0195	0.0324	-0.0619	0.0184	-0.0037	-0.0863
	(0.25)	(0.26)	(-0.57)	(0.24)	(-0.04)	(-0.67)
IT*fixreg	-0.0314	0.0269	-0.0232	-0.1534***	Exclu	-0.0819 ***
	(-0.58)	(1.27)	(-0.52)	(-3.13)		(-11.28)

Table 6: Real exchange rate volatility and the effect of IT-exchange rate regimes policy mix: RR's De Facto classification - continued

IT*intereg	-0.0391**	-0.0218	-0.0180	-0.0830*	-0.1272**	-0.0190
	(-2.25)	(-0.75)	(-0.68)	(-1.71)	(-2.65)	(-1.22)
reg	-0.0420***	-0.0180	-0.0437***	-0.1162**	-0.1331**	-0.0624***
	(-2.99)	(-0.79)	(-2.84)	(-2.39)	(-2.50)	(-6.93)
hypinf	0.0649	0.0613	(dropped)	0.1084	0.1334	(dropped)
	(1.47)	(1.02)		(1.49)	(1.58)	
Constant	0.0861***	0.0689***	0.0769***	0.1568***	0.1817***	0.1017***
	(6.65)	(4.11)	(4.74)	(3.21)	(3.31)	(7.97)
AR(2)	-0.22	-0.35	1.44	-0.18	-0.88	1.46
	[0.828]	[0.725]	[0.150]	[0.858]	[0.380]	[0.144]
Hansen J test	19.47	9.62	8.95	20.18*	14.77	14.18
	[0.302]	[0.650]	[0.776]	[0.064]	[0.254]	[0.862]
Difference-in-	0.66	0.15	0.96	3.57	2.57	0.14
Hansen C test	[0.882]	[0.930]	[0.620]	[0.167]	[0.277]	[0.986]
F-statistic	6.21***	6.95***	10.86***	16.80***	4.47***	72.25***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]
Observations	406	205	201	418	213	205
Countries	62	32	30	62	32	30
Instruments	29	24	24	24	23	32

See tables 4 for notes. The IT*fixreg variable has not any observations in developing countries. IT*flexreg is used for identification in the regression.

3.3.2. Results Analysis: De Facto Classification

Using the De Facto regimes, the results appear more interesting. For the total sample, the column IV indicates that the combination of IT and fixed regimes (IT*fixreg) leads to the lowest degree of RER volatility (approximately 15.34% less RER volatility than IT and flexible regimes combination). IT-Intermediate regimes policy mix can minimize approximately 8.30% less RER volatility than IT-flexible regimes policy mix. In addition, the parameter on the dummy variable for ERR without IT policy (reg) is -0.1162, suggesting 11.62% less RER volatility than IT-flexible regimes policy mix.

When this is broken down by developed versus developing countries, it seems that the estimation results are guided by the experience of developed countries. For developing countries, column V shows that ERR without IT perform the best in terms of minimizing RER volatility followed by IT-intermediate regimes policy mix (their parameters respectively are -0.1331 and -0.1272).

Concerning the developed countries, IT combined with fixed regimes remain the combination which can deliver the lowest levels of RER volatility. Indeed, as shown in column VI, the combination of IT and fixed regimes (IT*fixreg) decreases approximately 8.19% less volatility than the combination of IT and flexible regimes. In addition, ERR without IT (reg) minimize approximately 6.24% less RER volatility compared to IT-flexible regimes policy mix. The parameters for both IT*fixreg and reg dummies are statistically significant. However, the coefficient for the variable IT combined with intermediate regimes is statistically insignificant, suggesting that there is no fundamental difference between the effect of IT-intermediate regimes policy mix and IT-flexible regimes policy mix on the RER volatility.

4. Summary and Concluding Remarks

The effect of the adoption of the policy of inflation targeting on the volatility of exchange rates has been the subject of a number of empirical studies. Baba, Engle, Kraft and Kronerarguez (1990), Berganza and Broto (2012), De. Gregorio and al. (2005), Edwards (2007), Adolfson (2007) and Goldstein (2002) found that the exchange rate volatility tends to increase under inflation targeting. Instead, Rose (2007), Pontines (2011), Hausmann, Panizza and Rigobonindiquez (2004) and Choudhri and Hakura (2006) proved that the adoption of IT policy has as consequence the reduction in the

volatility of exchange rate. These controversies of results in these studies led us to revalue the effects of IT policy on the real exchange rate volatility while trying to determine the role of exchange rate regimes.

Using two-step system-GMM estimator, we estimated a dynamic model of real exchange rate volatility for a panel of 62 countries covering the period 1985-2009. The sample chosen in this work contains 32 developing countries (including 14 IT countries and 18 non-IT countries) and 30 developed countries (including 13 IT countries and 17 non-IT countries).

Regardless of exchange rate regimes, the results of the estimates indicate that, in the developed countries, the adoption of IT is generally associated with an increase in the levels of average real exchange rate volatility. Moreover, we found that volatility is higher in IT countries than in non-IT countries. For developing countries, IT does not have the effect on the real volatility of rate of exchange. In other words, there is not a fundamental difference between the volatility levels in IT and non-IT developing countries. Besides, the results showed that the volatility before the adoption of IT in developing countries are not differed fundamentally from those after the adoption of IT. The estimates for total sample prove that the adoption of IT increases the average levels of real exchange rate volatility. One can thus conclude that there is generally a negative relationship between IT and real exchange rate volatility. This implies that the increasing volatility of real exchange rate represents a cost of the adoption of IT policy. Our results confirm those found by Berganza and Broto (2012), De. Gregorio et al. (2005), Edwards (2007) and Pontines (2011) (in the case of developed countries). On the other hand, they are in opposition to the results of Rose (2007) and Pontines (2011) (in the case of developing countries).

Seeking the exchange regime able to provide the lowest degree of RER volatility, we found that fixed and intermediate regimes perform the best in terms of limiting RER volatility respectively for developed and developing countries, according to De jure classification. Using the De facto classification, fixed regimes lead to the lowest degree of RER volatility for both developing and developed countries.

Finally, regarding the optimal combination of IT and exchange rate regime that can provide the lowest levels of RER volatility, the results show that the volatility generally is in its low levels in periods before the adoption of IT policy and it is low in non-IT countries than in IT countries. When this is broken down by developed versus developing countries, the use of De jure classification prove that there is no clear tendency that emerges between the effects of different policy mix for both groups of countries.

However, for developed countries, the De Facto classification shows that the mix of inflation targeting and fixed exchange rate regimes policies produce the lowest levels of real exchange rate volatility. For developing countries, it proves that the mix of inflation targeting and intermediate exchange rate regimes policies perform better than the other policy mix in terms of real exchange rate volatility. Another important conclusion deducted is that the mix of inflation targeting and flexible exchange rate regimes policies are associated with the largest degree of real exchange rate volatility in the most cases.

In summary, we conclude that the adoption of both inflation targeting and flexible exchange rate regimes policies can be considered a source of real exchange rate volatility, as it makes the exchange rate more volatile. Thus, we deduce that the Fear of Floating is justified in both developing and developed countries.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Symmetry of Inflation and Economic Growth Transmission in the Euro Area in the Respect to a Single Monetary Rule

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Abstract

The objective of the research is to investigate inflation and economic transmission among the Visegrad countries (Czech Republic, Hungary, Poland and Slovakia) and the euro area. Narrow external trade and integration relations suppose significant level of transmission within the observed countries. Level of (a)symmetry among inflation and economic growth shocks can be crucial for a single monetary rule application. Importance of this issue is not relevant only for Slovakia, the euro area member since 2009, but for the Czech Republic, Hungary and Poland, too, as the future euro area member. Estimation of inflation and economic growth transmission is based on the vector error correction model. Variance decomposition enables us to observe these interdependences among particular countries throughout several horizons. Dominance of the euro area is more obvious in the case of economic growth. Therefore, from the perspective of the Visegrad countries, a potential single monetary rule should put more weight on economic growth than inflation. However, due to an endogenous argument, level of these interdependences should increase gradually in time. The paper was elaborated within the project VEGA 1/0973/11.

Keywords: Inflation transmission, economic growth transmission, the euro area, the Visegrad countries, monetary rules
JEL Classification Codes: F15, F42, E52

1. Introduction

Monetary rules versus discretionary monetary strategies are often discussed in connection with the time inconsistency problem of monetary policy. The time inconsistency issue is essentially based on the contributions by Kydland and Prescott (1977) and Barro and Gordon (1983). Their conclusions stress macroeconomic advantages of monetary rules comparing with discretionary approach. According to their findings monetary rules help to reduce inflation without economic output decrease.

However, the role of monetary rules can be questionable in terms of economic crisis and monetary integration. Consequently, a unique monetary policy e.g. under the form of a unique monetary rule can be problematic. The aim of the paper is to consider implementation of a single monetary rule from the perspective of the Visegrad countries (V4), i.e. future euro area member states (the Czech Republic, Hungary and Poland) and actual euro area member (Slovakia). The Visegrad region consists of countries with quite similar economic background and integration process. The countries have experienced transition process since 1989 and they joined the European Union in 2004.

Slovakia adopted euro in 2009 as the first country from the Visegrad group. Other three countries should be its followers in the coming years. On the one hand, recent economic evolution has been similar in these countries. On the other hand, their particularities, e.g. at the level of external openness, production structure diversification, etc. can lead us to different results. Is there an interdependence among output and inflation evolution in the mentioned countries and the European Monetary Union? Would be a unique monetary rule or central bank reaction function based on inflation and output indicators convenient for the Visegrad countries as future or actual members of the European Monetary Union?

The aim of the paper is to evaluate cointegration of inflation and output in the Visegrad countries and the euro area. These two indicators are crucial in the most of monetary rules as well as in the Taylor rule - one of the best known rules (Taylor, 1993).

However, the role of monetary rules has been contested by certain economists (Belke, Klose, 2011) due to economic crisis. Others (Taylor, 2009) claim that negative impacts of economic crisis would be weaker under monetary rules application.

The implementation of monetary rules in the European Monetary Union is even more questionable as several authors (Bucur, Ancuba, 2012) have doubts about the euro area optimality because of inflation and output shocks asymmetry. Others (Liapis, 2012) suggest fiscal integration in the euro area to avoid future financial and debt crises. Consequently, this research takes into account period of economic crisis and monetary integration, too.

2. Literature Background

Until the 19th century, the discretionary strategy was preferred by most of the countries in the world. No precise monetary rules were applied by monetary authorities except the "gold standard" and the exchange rate stability (Lewis, 2010). However, during the last hundred years, monetary rules have found their followers.

Wicksell (1989) brought a very simple rule, yet it was not widely spread. It was based on the principle that the interest rate in the economy was only influenced by one parameter - price stability. On the other hand, Friedman's k-percent rule is world known (Friedman, 1968). Friedman claimed that the rate of growth of money supply should be equal to the rate of growth of real GDP in economy. This rule supposes a stable velocity of money.

Even more significant increase in the number of monetary rule followers came in the 1970s and the 1980s. It was the case of Kydland and Prescott (1977) for instance. They pointed out the problem of time inconsistency. According to their findings, monetary rules should reduce the time inconsistency occurrence.

Brennan and Buchanan (1981) defended policy rules, too. They were convinced that discretionary policy enables a central bank to generate inflation above its optimal level. Barro and Gordon (1983) expanded this theory in the 1980s and claimed that monetary authority will always have propensity to lower the unemployment at the expense of higher inflation.

McCallum suggested a rule today known as the McCallum one (1988). The author focused on monetary base as a central bank's target. This parameter is influenced by inflation rate, real GDP growth and growth of velocity of money. McCallum claims the US economy would have achieved better results if it had followed his rule, especially in 1930s and 1970s.

In 1993 Taylor presented a monetary rule which became very popular thanks to its simplicity and accountability. The rule was suggested as an efficient tool for monetary policy decision making process. In general, the Taylor rule is considered to be a supplement monetary tool to inflation targeting. The rule focuses on achieving the inflation target in a middle-run. Moreover, it reacts to the GDP evolution that is closely connected to the inflation. The rule enables to quantify short-term nominal interest rates set by a central bank in response to inflation and output gap evolution.

Svensson (2003) criticises the rule because of small number of parameters determining the monetary policy. Consequently, the rule does not take into account other parameters.

It seems that the current economic crisis has contested the reliability of the Taylor rule. Results of Rudebusch (2009) have shown that the interest rate in the U.S. should reach the values of about -5% during 2009 according to the Taylor rule. It is, of course, impossible to implement in practice. As current federal funds interest rate is 0%, the difference between calculated and real value is significant, i.e. 5%. On the other hand, except the current crisis, the Taylor rule results corresponded quite well to reality from 1988 to 2008 (Rudebush, 2009).

Nevertheless, Taylor defends his rules against the criticism. He claims that if the FED respected original version of his rule, the results would be convenient even during the crisis.

Several authors suggested the Taylor rule or the Taylor type rules for the European Monetary Union. Gerlach and Schnabel (1999), Gerlach and Smets (1999) found out that interest rate in the euro area given by Taylor was moving very closely to the interest rate in a real economy. Exceptions were only in years 1992 and 1993. That period was characterised by disturbances on exchange market and currency crises in Europe e.g. in Great Britain and Sweden. Adema (2004) researched the Taylor rule application in the euro area, as well. In order to compare the results based on various data, she decided to analyse the situation both with ex-post and actual data. Finally, she recommended using of actual data available in the period when a monetary authority decides about the height of interest rate. Belke and Cui (2009) applied the Vector Error Correction Model (VECM) methodology to verify interdependence between the U.S. and European interest rates in terms of the Taylor rule. They confirmed this interdependence by their general VECM and found out that the European Central Bank followed the Fed´s strategy during 1999 - 2006. Eleftheriou, Gerdesmeier and Roffia (2006) analysed the possibility of the Taylor rule application in the pre-European Monetary Union era. They concluded that convenient rules were distinct for each country. Gerlach-Kristen (2003) presented an alternative policy rule for the euro area, i.e. a reaction function which takes the non-stationarity of the data into account. His estimated interest rate rule is stable and forecasts well. He applied cointegration analysis. Ullrich (2005) estimated linear equations with the OLS method to the central bank's reaction function within the EMU countries and the U.S. She applied her research for the period before and after 1999, i.e. before and after creation of the EMU. She described significant differences between the central bank´s reaction functions before and after 1999 and between the EMU countries and the U.S.

Altavilla (2003) appreciates performance of monetary rules in the EMU and he recommends forward-looking approach in the rules.

Application of a unique monetary policy and eventually of a single monetary rule has to deal with asymmetry problems between countries. This imbalance can be linked to different economic cycles and inflation bias in particular countries. The unevenness is significantly influenced by various shocks (supply, demand, inflation, etc.). The problem of shock asymmetry in the European Union was researched by several authors, e.g. Horváth (2003). According to his findings asymmetry of shocks in the euro area seemed to be quite important during first decade of monetary integration. However, it is possible to expect improving of the situation e.g. due to the endogenous argument (Frankel, 2009). Frankel explained that monetary integration would lead to gradual symmetry among business cycles and economic fundamentals in general. Business cycles in the Visegrad countries have been recently studied by Tkáčová (2012) using composite leading and cyclical indicators. Yet, it is necessary to take into account impact of foreign direct investments on the Visegrad countries business cycle evolution (Šoltés, Šoltés, 2003).

3. Research Method and Data

3.1. Research Method

Research methodology of the paper is based on the vector error correction model estimation. This procedure enables us to determine long and short term equilibrium among inflation and output in the Visegrad countries.

The vector error correction model analyses interdependence of observed time series taking into account lagged values. This fact enables us to research links among variables more comprehensively. Nevertheless, this type of models requires stationarity testing. Generally speaking, non-stationarity (presence of a unit root) is typical for economic time series. Non-stationarity of level values can be eliminated e.g. by first or second differences. The vector error correction model combines two types of variables; non-stationary level (long-run) values and stationary first differences (short-run) values.

A non-stationary time series, e.g. under the form of a random walk with a drift

$y_t = \beta_0 + y_{t-1} + u_t$.

can become stationary after first difference calculation

$\Delta y_t = y_t - y_{t-1} = (1-L)\, y_t = \beta_0 + u_t$ . .were L is a lag operator. If y_t comprises one unit root (order 1), first differences will eliminate non-stationarity problem. If y_t comprises two unit roots (order 2), second difference are needed

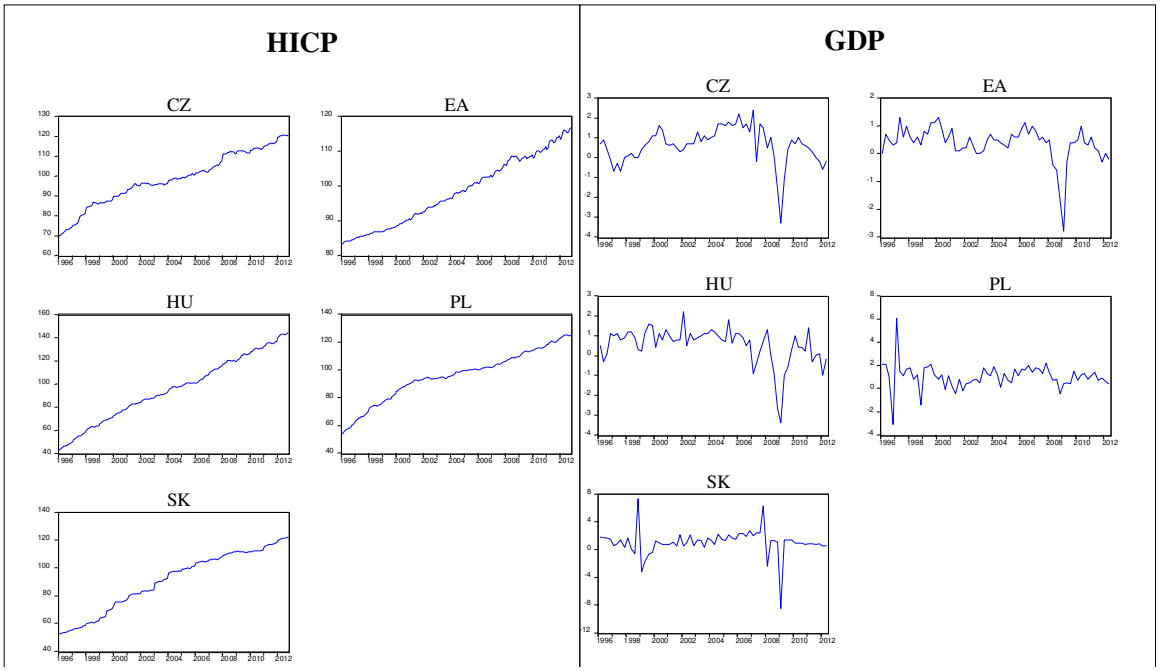
$$(1-L)^2 y_t = \Delta y_t - \Delta y_{t-1} = \Delta^2 y_t = u_t \Rightarrow y_t \sim I(2), \Delta y_t \sim I(1), \Delta^2 y_t \sim I(0).$$

Unit root testing can be realised using several approaches, e.g. the Augmented Dickey Fuller (ADF), Elliot-Rothenberg-Stock DF-GLS or Phillips–Perron tests. A standard Augmented Dickey Fuller test is performed in the research as recommended by Dolado et al. (1990).

Consequently, cointegration process can be carried out. Presence of cointegration among variables can be tested through Engel-Granger, Johansen or Johansen and Juselius procedures. Johansen or Johansen and Juselius concepts allow us to research several time series simultaneously. We have decided to perform Johansen Trace Test. Johansen Trace test determines number of equilibrium cointegration equations and eventual presence of trends and/or constants.

Figure 1: HICP and GDP in the V4 Countries and the Euro Area, 1996 – 2012

Error!



HICP - harmonised indices of consumer prices (fixed based index, 2005=100) and GDP - gross domestic product, seasonally adjusted; CZ – the Czech Republic, EA – the euro area, HU – Hungary, PL – Poland, SK - Slovakia

Finally, the vector error correction model is applied to reveal the structural shocks from the residuals. The Cholesky decomposition was chosen to display the residual variance-covariance matrix where the correct ordering of the variables is crucial.

As a shock on the later ordered variable in the system does not contemporaneously affect the previous ones, we choose the order based on the size of economies: euro area, Poland, Hungary, Czech Republic and Slovakia.

3.2. Data

As inflation and output are two main explaining variables of the monetary policy rules, e.g. the Taylor rule, harmonised indices of consumer prices and gross domestic product were chosen for the purpose of our analysis. Data, covering the period from 1996 to 2012, are seasonally adjusted and were retrieved from the Eurostat. As we are focusing on the problematic in the respect to the euro area, harmonised indices of consumer prices (HICP) seem to be the most appropriate indicator of inflation. HICP are fixed based indices to year 2005 (2005=100). HICP capture monthly and gross domestic product (GDP) quarterly data. HICP cover 202 and GDP 66 observations. A relatively small number of GDP observations may sometimes influence significance of the model results. Nevertheless, such practice is in line with other authors (see Narayan et al., 2008).

Evolution of HICP and GDP in the particular Visegrad countries and the euro area in average is displayed in Figure 1. We can observe similar evolution of HICP and GDP from 1996 to 2012 which is in line with transition and integration process of the V4 group. Impact of recent financial and economic crisis is obvious in all observed countries apart from Poland which is relatively the least open economy and consequently the least sensitive to shocks from other countries.

Table 1: Descriptive Statistics of HICP and GDP in the V4 Countries and the Euro Area

HICP	**Euro Area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**
Mean	98.26970	95.53812	95.32322	98.62228	90.76233
Median	97.94500	98.10000	96.89500	98.45000	97.37500
Maximum	116.7800	125.3000	143.5200	120.7000	122.0600
Minimum	83.22000	53.60000	42.49000	70.00000	52.64000
Std. Dev.	9.793462	17.96139	27.80943	13.09254	21.37227
Skewness	0.159423	-0.460196	-0.067984	-0.252243	-0.377244
Kurtosis	1.745488	2.532822	1.975434	2.321185	1.793036
Jarque-Bera	14.10183***	8.966912**	8.990881**	6.020406**	17.05229***
Sum	19850.48	19298.70	19255.29	19921.70	18333.99
Sum Sq. Dev.	19278.29	64844.90	155446.2	34454.31	91811.58
Observations	202	202	202	202	202
GDP	**Euro Area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**
Mean	0.3818	1.0469	0.5333	0.6197	1.0287
Median	0.5000	1.1000	0.8000	0.7000	1.1500
Maximum	1.3000	6.1000	2.2000	2.4000	7.3000
Minimum	-2.8000	-3.1000	-3.4000	-3.3000	-8.5000
Std. Dev.	0.6194	1.0664	0.9254	0.9187	1.8657
Skewness	-2.5853	0.5175	-1.9174	-1.2665	-1.4522
Kurtosis	13.3982	12.1807	8.2641	6.8101	14.2697
Jarque-Bera	370.8622***	234.7326***	116.6480***	57.5662***	372.4729***
Sum	25.2000	69.1000	35.2000	40.9000	67.9000
Sum Sq. Dev.	24.9381	73.9243	55.6666	54.8644	226.2753
Observations	66	66	66	66	66

HICP - harmonised indices of consumer prices (fixed based index, 2005=100) and GDP - gross domestic product, seasonally adjusted

Descriptive statistics of the data are presented in Table 1. Evolution of HICP has the lowest standard deviation in the euro area. Extreme values of GDP explained by kurtosis are the least frequent in the Czech Republic. The highest average economic growth is in Slovakia and Poland, the lowest one is in the euro area.

Table 2: Correlation Matrix of HICP and GDP in the V4 Countries and the Euro Area

HICP	**Euro Area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**
Euro Area	1.000000	0.957854	0.990366	0.972266	0.974162
Poland		1.000000	0.986281	0.990838	0.975488
Hungary			1.000000	0.991685	0.983570
Czech Rep.				1.000000	0.971599
Slovakia					1.000000
GDP	**Euro Area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**
Euro Area	1.000000	0.477880	0.424577	0.395579	0.067523
Poland		1.000000	0.149859	0.250694	0.058020
Hungary			1.000000	0.273776	-0.163157
Czech Rep.				1.000000	0.398227
Slovakia					1.000000

Pearson correlations

Correlation matrix in Table 2 displays Pearson correlations among analysed countries as for their HICP and GDP. Correlations within HICP are statistically very significant, unlike GDP evolution. These findings seem to be in line with intuitive observation of Figure 1. However, the vector error correction model and the consequent variance decomposition will lead us to more relevant conclusions as it takes into account lagged values, too.

4. Results and Discussion

As it is typical for economic time series, level values are non-stationary (see Table 3). First differences permit us to reach required stationarity. The Augmented Dickey-Fuller testing was applied in this research. Test results indicate that all time series are integrated of order one, which is crucial to perform the cointegration analysis.

Table 3: Augmented Dickey-Fuller stationarity testing

	Level values		**First differences**	
HICP	**C, T, L**	**t-stat**	**C, T, L**	**t-stat**
Czech Rep.	C, T, L=0	-2.8318	C, L=13	-3.5731**
Hungary	C, T, L=14	-2.5325	C, L=13	-3.4684***
Poland	C, T, L=1	-3.1156	C, T, L=0	-8.6495**
Slovakia	C, T, L=0	-0.8908	C, L=0	-12.6541**
Euro Area	C, T, L=13	-3.2491	C, L=13	-3.2384**
GDP	**C, T, L**	**t-stat**	**C, T, L**	**t-stat**
Czech Rep.	C, T, L=0	-3.2439	C, L=0	-9.3871***
Hungary	C, T, L=0	-3.1031	C, L=0	-9.5624***
Poland	C, T, L=0	-3.1165	C, L=1	-11.1274***
Slovakia	C, T, L=0	-2.7174	C, L=2	-8.9804***
Euro Area	C, T, L=0	-3.0682	C, L=0	-8.8397***

C= constant (intercept), T = trend, L = number of lags; *, **, *** indicates statistical significance at different 1, 5, 10 % level; 5 % level was chosen to be a decisive criterion to reject/accept the alternative hypothesis

As it is obvious from Table 4, the Johansen Trace test determines one equilibrium cointegration equation for HICP as well as GDP. Trend and constant are found out in case of HICP. GDP cointegration equation includes only constant (see Table 5).

Table 4: Unrestricted Cointegration Rank Test (Trace)

HICP				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.**

Table 4: Unrestricted Cointegration Rank Test (Trace) - continued

None *	0.1987	95.7104	88.8038	0.0145
At most 1	0.1184	52.0472	63.8761	0.3275
At most 2	0.0654	27.2191	42.9152	0.6684
At most 3	0.0434	13.8830	25.8721	0.6672
GDP				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.**
None *	0.4550	80.1219	69.8188	0.0060
At most 1	0.2166	41.8804	47.8561	0.1621
At most 2	0.1839	26.4969	29.7970	0.1145
At most 3	0.1265	13.6920	15.4947	0.0918

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level; *, **, *** indicates statistical significance at different 1, 5, 10 % level; 5 % level was chosen to be a decisive criterion to reject/accept the alternative hypothesis; MacKinnon-Haug-Michelis (1999) p-values;

Table 5: Cointegration

	Euro Area	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**trend**	**constant**
Estimation for HICP							
Cointegration vector β	1.000	-0.5505 [-2.4268]	-2.6011 [4.5773]	-1.1452 [-4.1214]	-0.1004 [1.9984]	-1.0011 [-5.0003]	-89.8288
Error correction vector α	-0.0078 [-1.0152]	0.0146 [1.9698]	-0.0472 [-3.6245]	0.0104 [2.1232]	-0.0188 [-2.1413]	-	-
Estimation for GDP							
Cointegration vector β	1.000	-0.2364 [-1.9868]	-0.5451 [-4.0706]	-0.8947 [-5.7569]	-0.3762 [3.5585]	-	0.5958
Error correction vector α	0.0487 [0.4151]	-0.1127 [-0.7041]	0.4070 [2.1605]	1.1109 [4.2467]	-1.4576 [-3.1835]	-	-

α - error correction vector, β - cointegration vector

The opposite signs of the estimated cointegration coefficients β in Table 5 between the euro area and the V4 group confirm the idea of the euro area dominance in the Central European region in long term. The opposite signs indicate positive relationship. Increase of HICP and GDP in the euro area leads to rise of these indicators in the V4 countries in long-run. On the other hand, the short term euro area impact on the V4 economies expressed by error correction vector α is not so obvious. The long term impact is evident in case of HICP and GDP, too.

Variance decomposition based on the vector error correction model captures mutual impacts and transmissions among observed countries as for their HICP or GDP respectively. Table 6 expresses HICP forecast variance decomposition with lags corresponding to 1, 3, 6, 12 and 24 months. Cumulative impacts of shocks are calculated from the perspective of the V4 (eventually V3 remaining countries) and foreign countries (including the euro area).

As expected the impact of inflation in the V4 countries on the euro area inflation is quite weak, i.e. maximally 21.8% in 6-month period with decreasing tendency in the following months. However, impact of the euro area on particular V4 countries is smaller than supposed (maximally at the level of 7.2% in the case of Hungary). Mutual influence of the V4 countries is more important. Economic and trade interdependence within the V4 group seems to have higher importance. It can also correspond to territorial structure of their external trade. Besides trade with Germany, the V4 business transactions have the most important volume in these countries.

Table 6: HICP Forecast Variance Decomposition

Variance Decomposition of HICP in the Euro Area

explained country	period (month)	euro area	Poland	Hungary	Czech Republic	Slovakia	V4	foreign countries
Euro Area	1	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	3	84.8288	9.4763	3.7775	1.2359	0.6813	15.1710	15.1710
	6	78.1902	15.5314	3.6386	1.4964	1.1431	21.8095	21.8095
	12	80.9099	13.0831	2.6903	1.2144	2.1021	19.0899	19.0899
	24	81.8550	11.7053	2.7377	1.4465	2.2552	18.1447	18.1447
Variance Decomposition of HICP in Poland								
explained country	**period (month)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Poland	1	2.8375	97.1624	0.0000	0.0000	0.0000	0.0000	2.8375
	3	2.7240	95.2910	0.1807	1.1994	0.6046	1.9847	4.7087
	6	1.9760	90.7257	2.4133	4.2808	0.6041	7.2982	9.2742
	12	1.0100	84.9096	4.2543	8.5354	1.2905	14.0802	15.0902
	24	0.5161	76.3570	9.6993	11.4350	1.9924	23.1267	23.6428
Variance Decomposition of HICP in Hungary								
explained country	**period (month)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Hungary	1	6.1749	20.5133	73.3116	0.0000	0.0000	20.5133	26.6882
	3	1.7906	31.1190	64.3810	2.6100	0.0991	33.8281	35.6187
	6	4.8226	32.2874	49.4007	13.4343	0.0547	45.7764	50.5990
	12	6.8625	22.5868	38.7503	30.4213	1.3789	54.3870	61.2495
	24	7.1569	18.6252	36.6343	34.9931	2.5903	56.2086	63.3655
Variance Decomposition of HICP in the Czech Republic								
explained country	**period (month)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Czech Republic	1	0.0038	11.9049	23.7137	64.3774	0.0000	35.6186	35.6224
	3	0.7626	14.0593	21.1551	63.8158	0.2072	35.4216	36.1842
	6	2.1916	14.8533	15.7591	64.2681	2.9307	33.5431	35.7347
	12	1.9876	8.6572	16.0521	65.8691	7.4337	32.1430	34.1306
	24	2.5136	8.4594	25.2246	55.8378	7.9644	41.6484	44.1620
Variance Decomposition of HICP in Slovakia								
explained country	**period (month)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Slovakia	1	1.4424	0.0391	5.4445	11.6780	81.3957	17.1616	18.6040
	3	1.1455	0.0737	2.8091	11.9133	84.0582	14.7961	15.9416
	6	0.8105	2.1042	1.4961	7.8996	87.6894	11.4999	12.3104
	12	0.5428	2.8198	0.7584	3.6804	92.1983	7.2586	7.8014
	24	0.4150	2.7681	0.4967	2.2874	94.0326	5.5522	5.9672

Cholesky ordering: the euro area, Poland, Hungary, the Czech Republic, Slovakia

While HICP in Poland can be explained by more than 23% by HICP in the other V3 countries in the 24-month horizon, the euro area HICP influences Polish HICP by less than 3% in short term with diminishing tendency in longer horizon. Impact of the V3 partners on Hungarian and Czech HICP is even more important (up to 56.2% or 41.6% respectively in long run).

Table 7: GDP Forecast Variance Decomposition

Variance Decomposition of GDP in the Euro Area

explained country	period (trimester)	euro area	Poland	Hungary	Czech Republic	Slovakia	V4	foreign countries
Euro Area	1	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	2	94.4406	1.6680	3.2667	0.0224	0.6021	5.5592	5.5592
	4	93.4585	1.3011	3.7602	0.2026	1.2774	6.5413	6.5413
	6	94.1662	1.1199	3.4801	0.2404	0.9932	5.8336	5.8336

Table 7: GDP Forecast Variance Decomposition - continued

	8	94.7141	0.9124	3.2962	0.2356	0.8414	5.2856	5.2856
Variance Decomposition of GDP in Poland								
explained country	**period (trimester)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Poland	1	7.2068	89.1489	3.2054	0.4387	0.0000	3.6441	10.8509
	2	11.0047	82.4904	3.3783	0.4841	2.6422	6.5046	17.5093
	4	17.9378	66.1207	7.6843	0.5670	7.6900	15.9413	33.8791
	6	22.0026	60.8788	7.0961	0.8640	9.1583	17.1184	39.1210
	8	25.6537	55.3283	6.9329	0.8330	11.2519	19.0178	44.6715
Variance Decomposition of GDP in Hungary								
explained country	**period (trimester)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Hungary	1	38.0309	0.9827	60.9862	0.0000	0.0000	0.9827	39.0136
	2	47.3604	2.0945	49.7302	0.3617	0.4529	2.9091	50.2695
	4	54.8386	1.5881	38.0040	4.7820	0.7871	7.1572	61.9958
	6	57.5964	1.3762	35.5640	4.8794	0.5838	6.8177	64.4141
	8	58.6527	1.3545	34.3456	5.1658	0.4811	7.0014	65.6541
Variance Decomposition of GDP in the Czech Republic								
explained country	**period (trimester)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Czech Republic	1	30.4570	0.0000	0.0000	69.5429	0.0000	0.0000	30.4570
	2	53.2492	0.4032	2.8285	42.0329	1.4859	4.7176	57.9668
	4	59.3454	0.2388	2.8417	35.6466	1.9271	5.0076	64.3530
	6	62.5068	0.2818	2.5572	32.9984	1.6556	4.4946	67.0014
	8	63.8001	0.2216	2.5561	31.8022	1.6198	4.3975	68.1976
Variance Decomposition of GDP in Slovakia								
explained country	**period (trimester)**	**euro area**	**Poland**	**Hungary**	**Czech Republic**	**Slovakia**	**V3**	**foreign countries**
Slovakia	1	4.4735	3.8292	0.3108	5.9475	85.4388	10.0875	14.5610
	2	20.8446	5.4140	0.8810	8.8060	64.0542	15.1010	35.9456
	4	20.8117	6.3661	3.9033	10.5456	58.3731	20.8150	41.6267
	6	25.7889	5.3303	4.8980	10.6175	53.3651	21.6290	47.4179
	8	27.8470	5.1326	5.5709	10.9255	50.5238	21.6290	49.4760

Cholesky ordering: the euro area, Poland, Hungary, the Czech Republic, Slovakia

Slovak HICP seem to be least dependent from the V3 (maximally 17.2%) and the euro area HICP (maximally 1.4%). These findings can be quite surprising as Slovakia is very small and open economy with very narrow business and trade links with observed countries including the euro area. However, this result can be explained by Slovak membership in the European Exchange Rate Mechanism II since 2005 and consequent euro adoption. Thus, Slovakia had to maintain low and stable inflation resistant to external shocks.

Table 7 captures GDP forecast variance decomposition with lags corresponding to 1, 2, 4, 6 and 8 trimesters. Impact of the V4 GDP on the euro area growth is even weaker than in the case of HICP. Unlike previous case, GDP transmission from the euro area to the V4 is more obvious than within the V4 group itself. Polish, Hungarian and Czech GDP is explained by 25.6%, 58.7% or 63.8% respectively by the euro area GDP in 2-year horizon. The impact corresponds to the openness of economy. Polish economy is the least open and largest economy from the V4 countries, thus the GDP transmission is the lowest. Slovakia represents again an exception. Impact of foreign GDP on Slovak growth is relatively small (comparing with the Czech Republic and Hungary) which can be caused by above mentioned euro adoption preparations, consequent economic policy measurements, and important reforms during last decade (e.g. tax reform).

6. Conclusions

In conclusion, HICP transmission process between the euro area and the V4 countries on the other hand is much weaker than HICP transmission within the V4 countries. As for GDP, the opposite seems to be true. Mutual interdependence of HICP evolution in the V4 countries can stem from similar disinflation and transition process in 1990s as well as almost equivalent purchasing power. Significant impact of the euro area economic growth on the V4 growth is caused by the V4 dependence on the euro area trade, demand and investments. Nevertheless, Slovakia represents an exception due to its recent integration to the European Monetary Union.

Application of a single monetary rule seems to be ambiguous. While economic growth shocks are relatively symmetrically transmitted from the euro area to the V4 countries, inflation shocks are transmitted mostly only within the V4. This interdependence is obvious also during current financial and economic crisis. Therefore, in respect to the observed countries, a common monetary rule should put more weight rather on GDP or output gap than on inflation gap. Yet, in line with endogenous argument this situation should change in the future. We can expect that inflation shocks will evolve more symmetrically also due to increasing purchasing power in the V4 countries.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

The Impact of Internal Control to E-commerce Activities on the Quality of Internal Auditing in the Financing Companies Operating in Jordan

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Abstract

The study aims to identify the impact of Security and protection, legislation and laws on the quality of internal auditing in the financing companies operating in Jordan, which are (26) companies. A questionnaire was designed by the two researchers and distributed for this purpose on the internal auditors in companies and non-executive committees emanating from the Board of Directors who have direct contact with internal audit in each companies, the number of questionnaires distributed were (150) questionnaires, (120) suitable questionnaires were recovered for analysis, with the rate of recovery reached (80%). The questionnaire data was analyzed using the (SPSS) and a number of statistical techniques through descriptive statistics, arithmetic means, standard deviations and percentages, the study hypotheses were tested by multiple regression tests. The study found that there was no significant impact for the combined independent variables (Security and protection , legislation and laws) on the quality of internal auditing, but there is a statistically significant impact of Security and protection on the quality of its own internal auditing. The study recommends the interest of existing and decision-makers in the financing companies operating in Jordan to raise the level of legislation and laws in order to positively affect the quality of internal auditing in those companies.

Keywords: Internal Control to E-commerce, Quality of internal auditing.

1. Introduction

Due to the need for accounting information which is constantly growing, especially after the emergence of companies diversified large, thus increasing the burden of information on financing companies, so that the assembly, operation and data processing methods can produce different information that meets the needs of its users from outside and within the economic units, and this requires a system of internal control to e-commerce activities with high efficiency, especially in the financing companies. The information system of accounting is one of the subsystems of the information system, which works on the production data of a special nature, may contribute to the application of the requirements of internal control to e-commerce activities in financing companies operating in Jordan in the output of accounting information quality and efficiency of the replay, and could help meet the needs of management information on a continuous correct and appropriate, timely and meaningful and significant help in the process of planning, implementation and control of economic activities of the unit.

1.1. Problem of the Study

The problem with the study of the impact of the internal control requirements for the activities of electronic commerce in the financing companies operating in Jordan on the output of accounting information with high quality and appropriate and timely manner, allowing users to take advantage of that information, and rational decision-making, and planning and implementation.

Based on the foregoing, the formulation of the following questions:

1. Is there any impact of the Security and protection on the quality of internal auditing?
2. Is there any impact of the legislation and laws on the quality of internal auditing?

1.2. Significance of the Study

The importance of the study of the impact of the importance of internal control requirements for e-commerce activities in the preparation and provision of accounting information characteristics, quality and highly efficient, enabling users to take information from the wise decisions and policy-making and future plans. The importance of this study is the first that touched on internal control and linked to e-commerce activities with the quality of internal auditing.

1.3. Objectives of the Study

The study aims to identify the impact of internal control requirements for e-commerce activities on the quality of internal auditing in the financing companies operating in Jordan, and that by identifying the following sub-goals:

1. The impact of the Security and protection on the quality of internal auditing from the point of view of internal auditors in financing companies operating in Jordan.
2. The impact of the legislation and laws on the quality of internal auditing from the standpoint of internal auditors in financing companies operating in Jordan.

2. Previous Studies and Theoretical Literature

2.1. Previous Studies

(Papadopoulos, G.A.,1998) Modern Electronic Commerce environments are heavily web-based and involve issues such as distributed execution, multiuser interactive access or interface with and use of middleware platforms. Thus, their components exhibit the properties of communication, cooperation and coordination as in CSCW, groupware or workflow management systems. In this paper we examine the potential of using coordination technology to model Electronic Commerce activities and we show the benefits of such an approach. Furthermore, we argue that control-oriented, event-driven coordination models (which enjoy some inherent properties such as security) are more suitable for

Electronic Commerce than data-driven ones which are based on accessing an open shared communication medium in almost unrestricted ways

(Kugler,D.Vort, H, 2003) Tracing is an important mechanism to prevent crimes in anonymous payment systems. However, it is also a threat to the customer's privacy as long as its application cannot be controlled. Relying solely on trusted third parties for tracing is inadequate, as there are no strong guarantees that deanonymizations are only applied legally. A recent tracing concept is auditable tracing, where the customer has the power to control the deanonymization. With auditable tracing no trust is required, while it offers comparable tracing mechanisms .We present the first off-line payment system with auditable tracing. Our payment system supports coin and owner tracing as well as self deanonymization in the case of blackmailing. This work was supported by the Deutsche Forschungsgemeinschaft (DFG) as part of the PhD program (Graduiertenkolleg) "Enabling Technologies for Electronic Commerce" at Darmstadt University of Technology.

(Angella Amudo, Eno L. Inanga,2009) Internal control systems is a topical issue following global fraudulent financial reporting and accounting scandals in both developed and developing countries. A proactive preventive approach to the problem requires a critical evaluation of existing internal control structures in organizations to determine their capacity to ensure that the organization's activities are carried out in accordance with established goals, policies and procedures. This study is on the Regional Member Countries (RMCs) of the African Development Bank Group (AfDB) focusing on Uganda in East Africa. This paper develops a conceptual model used in evaluating the internal control systems in Public Sector Projects in Uganda financed by the African Development Bank. The outcome of the evaluation process is that some control components of effective internal control systems are lacking in these projects. This renders the current control structures ineffective. The study ends with recommendations to improve the existing internal control systems in the projects and suggests areas for further Research

(Paul K. Chaney, Mara Faccio, David Parsley,2011) We document that the quality of earnings reported by politically connected firms is significantly poorer than that of similar non-connected companies. Our results are not due to firms with ex-ante poor earnings quality establishing connections more often. Instead, our results suggest that, because of a lesser need to respond to market pressures to increase the quality of information, connected companies can afford disclosing lower quality accounting information. In particular, lower quality reported earnings is associated with a higher cost of debt only for the non-politically connected firms in the sample.

(Kaplan, David; Krishnan, Ramayya; et al,1998) Accounting information systems maintain and produce the data used by organizations to plan, evaluate, and diagnose the dynamics of operations and financial circumstances [1]. In addition to intraorganizational usage, the data produced by these systems is reported to external stakeholders such as stockholders or government agencies. In light of these external reporting requirements, AIS have been subject to considerable scrutiny and the data produced by these systems—financial statements are good examples—is required to be certifiably free of specific types of errors. These data quality assessments of AIS are conducted by professional assessors known as auditors.

(Kuo Lane Chen, Huei Lee, Bradley W. Mayer, 2001) The purpose of this paper is to study the security control techniques and its impact on Internet purchasing and electronic commerce. Various security-control techniques for e-commerce are: (1) authentication (2) encryption (3) electronic payment systems (4) internal security management, and (5) non-electronic payment options. A survey from three universities in three different states was conducted. Results suggest that students have general knowledge about security techniques used by businesses but they are not as familiar with electronic payment systems. Students, however, prefer entering credit card information on the Internet after they decide to purchase a product via the Internet

(Junaid and Shaikh 2005) explained How to use some of the computer-assisted auditing techniques (CAATs) more effectively with the emerging information technologies. They constructed an infrastructure with the support of emerging technologies. Electronic auditing (EA) framework–

prepared and used with information technology, these examples are object-oriented distributed middlewares, internet security technologies, and intelligent agents.

They found how a CPA may conveniently audit the loan account of a bank with EA framework. Auditors will have to design one specialized audit software for each auditee's electronic data processing (EDP) system. This system emulates EDP applications in the banking industry and is based on the Common Object Request Broker Architecture (CORBA) architecture industrial standard.

2.2. Theoretical Literature

2.2.1. First: Internal Control for Electronic Commerce Activities

Continuing technological innovation and competition among existing financing organizations and new entrants have allowed for a much wider array of financing products and services to become accessible and delivered to retail and wholesale customers through an electronic distribution channel collectively referred to as e-banking. However, the rapid development of e-banking capabilities carries risks as well as benefits.

The Basel Committee on Banking Supervision expects such risks to be recognized, addressed and managed by banking institutions in a prudent manner according to the fundamental characteristics and challenges of e-banking services. These characteristics include the unprecedented speed of change related to technological and customer service innovation, the ubiquitous and global nature of open electronic networks, the integration of e-banking applications with legacy computer systems and the increasing dependence of banks (financial companies) on third parties that provide the necessary information technology. While not creating inherently new risks, the Committee noted that these characteristics increased and modified some of the traditional risks associated with banking activities, in particular strategic, operational, legal and reputational risks, thereby influencing the overall risk profile of banking.

Based on these conclusions, the Committee considers that while existing risk management principles remain applicable to e-banking activities, such principles must be tailored, adapted and, in some cases, expanded to address the specific risk management challenges created by the characteristics of e-banking activities. To this end, the Committee believes that it is incumbent upon the Boards of Directors and banks'(financial companies) senior management to take steps to ensure that their institutions have reviewed and modified where necessary their existing risk management policies and processes to cover their current or planned e-banking activities. The Committee also believes that the integration of e-banking applications with legacy systems implies an integrated risk management approach for all banking (financing) activities of a banking institution.

To facilitate these developments, the Committee has identified fourteen Risk Management Principles for Electronic Banking to help banking institutions expand their existing risk oversight policies and processes to cover their e-banking activities.

These Risk Management Principles are not put forth as absolute requirements or even "best practice." The Committee believes that setting detailed risk management requirements in the area of e-banking might be counter-productive, if only because these would be likely to become rapidly outdated because of the speed of change related to technological and customer service innovation. The Committee has therefore preferred to express supervisory expectations and guidance in the form of Risk Management Principles in order to promote safety and soundness for e-banking activities, while preserving the necessary flexibility in implementation that derives in part from the speed of change in this area. Further, the Committee recognizes that each bank's risk profile is different and requires a tailored risk mitigation approach appropriate for the scale of the e-banking operations, the materiality of the risks present, and the willingness and ability of the institution to manage these risks. This implies that a "one size fits all" approach to e-banking risk management issues may not be appropriate.

For a similar reason, the Risk Management Principles issued by the Committee do not attempt to set specific technical solutions or standards relating to e-banking. Technical solutions are to be addressed by institutions and standard setting bodies as technology evolves. However, this Report

contains appendices that list some examples current and widespread risk mitigation practices in the e-banking area that are supportive of the Risk Management Principles.

Consequently, the Risk Management Principles and sound practices identified in this Report are expected to be used as tools by national supervisors and implemented with adaptations to reflect specific national requirements and individual risk profiles where necessary. In some areas, the Principles have been expressed by the Committee or by national supervisors in previous bank supervisory guidance. However, some issues, such as the management of outsourcing relationships, security controls and legal and reputational risk management, warrant more detailed principles than those expressed to date due to the unique characteristics and implications of the Internet distribution channel.

The Risk Management Principles fall into three broad, and often overlapping, categories of issues that are grouped to provide clarity: Board and Management Oversight; Security Controls; and Legal and Reputational Risk Management. **(Committee on Bank Supervision Basel , July 2003)**

2.2.2. Second: Quality of Internal Auditing

The Internal Audit Quality Assessment Framework is the Treasury's recommended approach to carrying out internal and external quality assessments. It has been designed to help evidence effective internal auditing in line with the Government Internal Audit Standards with a focus on outcomes that help our organizations to meet their public service delivery commitments **(The Internal Audit Quality Assessment Framework 7 sep 2011)**

Establishing a successful internal audit function requires more than just support and resources approved at board and senior management levels; or an external requirement by government and regulators; or encouragement by external auditors. These are all important drivers and influences for creating the function and setting the boundaries in which it will operate and provide services.

No internal audit function can be successful unless it is expert in the principles and practices of management, risk management, control, and governance in the sector in which it works and across the supply chains developed by its organization. This expertise demands not only knowledge of what these processes require but also an understanding of the principles on which they are based, experience of how they operate at all levels within an organization, and how they are reported to all stakeholders. This expertise has to be at the management level of internal auditing and with all internal auditors.

Successful organizations assess and manage their economic, environmental, and social risks, mitigating these through appropriate strategies and controls. Successful internal audit functions focus on this corporate social responsibility and its "triple bottom line" in all their engagements—across the entire range of an organization's strategies, policies, processes, and reporting. In many organizations internal auditing is seen as a facilitator in the assessment and management processes addressing these risks. To be successful today, the planning of internal audit engagements and the conducting of assurance and consulting reviews must always be linked to risks and controls in an organization's "triple bottom line." **(Jeffrey Ridley 2007)**

3. Hypotheses of the Study

H1:

There is no statistically significant impact at the level of statistical significance ($\alpha \leq 0.05$) of Security and protection on the quality of internal auditing**.**

H2:

There is no statistically significant impact at the level of statistical significance ($\alpha \leq 0.05$) of legislation and laws on the quality of internal auditing**.**

4. The Study Limits

Were selected financing companies operating in Jordan, being the most commonly used for electronic commerce among the other sectors, which need to be strict internal control with respect to information security and protection of the hack and piracy, and legislation and laws on this?

5. Variables of the Study

The variables of the study consist of: the independent variable, which represented in the Security and protection, and legislation and laws, while the dependent variable, it is the quality of internal auditing

6. Population and the Study Sample

The study population consists of financing companies operating in Jordan that are (26) companies at the time of the study, the study questionnaire was addressed to the internal auditors and non-executive committees emanating from the board of directors, who have direct contact with internal audit in each company. The questionnaire has been distributed by hand on a sample of the study, the number of questionnaires that were distributed were (150) questionnaires, (120) questionnaires were recovered which were suitable for analysis. Thus, the percentage of recovered and valid questionnaires for analysis is (80%).

7. Characteristics of the Study Sample Description

Table 1: Demographic characteristics of study sample

Variable	Category	Repetitions	Percentage
Gender	Male	102	85%
	Female	18	15%
Total		**120**	**100%**
Age	Less than 25 years	24	20%
	From 25 years to less than 35 years old	30	25%
	From 35 years to less than 45 years old	30	25%
	45 years old and above	36	30%
Total		**120**	**100%**
Obtained Professional Certificate	JAC	30	25%
	CPA	30	25%
	JCPA	12	10%
	CMA	12	10%
	Without certificates	36	30%
Total		**120**	**100%**
Job Title	Director of Internal Control Department	12	10%
	Assistant Director	12	10%
	Internal Auditor	48	40%
	Member of the Committee (Board of Directors)	48	40%
Total		**120**	**100%**
Experiences	Less than 5 years	24	20%
	From 5 years to less than 10 years	36	30%
	From 10 years to less than 15 years	36	30%
	From 15 years and above	24	20%
Total		**120**	**100%**

Distribution of respondents by demographic characteristics of the study sample as illustrated in the table no. (1) that showed the majority of the study sample in the gender variable is male, reaching

the percentage of (85%) of the members of the study sample, while the percentage of females was(15%) of the study sample, this reflects the nature of the profession or function.

It is also noted from the above table that more members of the study sample were within the age group of (45 and over), its percentage amounted to (30%), followed by age group of (25-35 years) and age group of (35-45) in the same proportion (25%) and finally, the age group of (less than 25 years old) reaching (20%), which indicates that there is consistency between age and experience of the study sample. It is also noted from the same table that the majority of the study sample do not hold certificates of professional accounting with a percentage of (30%). It is noted from the table that more members of the study sample, who are working as internal auditor and a member of the (Board Committee) reached to (40%), respectively. It is noted from the table mentioned previously that more members of the study sample whose their experience was between (5-10 years) and who have an experience between (10-15 years) with the same proportion, amounting to (30%), which indicates the presence of an inconsistency between age and years of job experience, where this considered as a positive sign , thus enhancing the scientific capacity to absorb the questionnaire questions and answer them properly, which help to strengthen governance on the hypotheses of the study.

Study Tool, its Description, Persistence and Sincerity:

A tool for achieving the purposes of the study has been developed, by reviewing the theoretical literature on the organizational and social factors, to study its impact on the quality of internal audit, the study tool included two parts: Part one: related to demographic internal auditors and audit committees emanating from the Board of Directors, as follows: gender, age, career certificate, job title, experience. The second part: it was devoted to measuring the impact of organizational and social factors on the quality of internal audit, Five Likert scale had been adopted in the development of the study tool, calculating the strength of their paragraphs as follows: (Strongly Agree) was given (5 degrees), (Agree) given (4 degrees), (moderately Agree) was given (3 degrees), (Disagree) given (2 degrees) and (strongly disagree) was given (one degree),and this will be treated to interpret the data as follows: (1-2.49) means low degree, (2.50-3.49) means medium degree and (3.5-5) means a high degree. The questionnaire was distributed which its paragraphs reached to (50) paragraphs, with four fields to include all the independent variables and the dependent variable.

Statistical Methods: For the purposes of analyzing the study data ,the following statistical methods were used:

Descriptive Analysis: This analysis adapted the arithmetic mean, standard deviation and percentages and analyzing the multiple regression to measure the impact of the independent variables (Security and protection, legislation and laws) on the dependent variable (Quality of Internal Audit). Also to test the study tool and the possibility of relying on it in testing hypotheses and to achieve the objectives of the study, the measure of internal consistency, Cronbach's alpha were used to measure the stability of sample's answers to the questions of the questionnaire,(Sekaran, 2003)explained the reliability internal coefficient among respondents and find that the statistically accepted value for this measure is 60% or more, the results of calculation of this coefficient showed that the stability in the fields of the tool was very high, which confirms the reliability of the questionnaire to test the hypotheses, as illustrated in the table no.(2).

Table 2: Coefficient transactions in a Cronbach's Alpha for fields of study

Field	Questions' Numbers	The Coefficient Alpha's Value
Security and protection	5	0.62
Legislation and laws	5	0.73
Quality of accounting information (Dependent Variable)	5	0.81
Tool as a whole	**15**	**0.83**

Tool credibility means the process of making sure that the statements contained in the study tool that could lead to the collection of data accurately (Sekaran, 2003).Study tool was presented on a number of specialists in business management, auditing and accounting in the Jordanian universities to determine the appropriateness of the questionnaire's paragraphs linguistically and the extent of its affiliation to the dimension which it was developed within it, the observations and arbitrators' opinions and their observations were taken into account and some passages were reformulated in the light of these observations. The Variance Inflation Coefficient Factor was used to make sure of the disconnection between the multiple independent variables (Multicollinearity).

Since the value of (VIF) is less than (4), as well as the value of (tolerance) was greater than (0.10) for all variables, that means there is no overlap between the independent variables, which reflects the strength of the study sample.

Table 3: Test the Strength of the Study Sample

Model	VIF	Tolerance
Security and protection	1.44	0.69
legislation and laws	1.44	0.69

8. Analyzing the Data Related to the Study Fields

In order to describe the impact of Security and protection l, legislation and laws on the quality of accounting information, the two researchers extracted the arithmetic means and standard deviations for the members of the study sample estimations to the questionnaire's paragraphs, and the following tables show that:

Table 4: First field: Security and protection (n=120)

Number	Security and protection	The Arithmetic Mean	Standard Deviation	Ranking
1	Financing companies take appropriate measures to verify the identity of clients for whom they provide services via the Internet, and authorized access	3.25	1.13	5
2	Methods are used to verify transactions and shall promote the (Non-Repudiation) and to determine accountability for electronic financing transactions	4.40	0.50	3
3	Financing companies confirmed the availability of appropriate controls for the authorization and the powers of access to the electronic financing systems and databases and applications	4.68	0.47	1
4	Financing companies guarantees the availability of appropriate measures to protect the credibility of the data records of electronic financing operations and information	4.48	0.51	2
5	Available to protect confidentiality of sensitive electronic transactions to be moved and / or stored in databases and are subject to constant Auditing	4.08	1.29	4
Total Field / Security and protection		**4.18**	**0.35**	**High**

Table no.(4) that the degree of **Security and protection** measurement in all paragraphs are high, the arithmetic mean ranged between (3.25-4.68), the first paragraph (3) Was (4.68), But in the last rank came paragraph (1) amounted to (3.25), the arithmetic mean of the total field/ **Security and protection** were (4.18) with a high degree.

Table 5: Second field: legislation and laws (n=120)

Number	legislation and laws	The Arithmetic Mean	Standard Deviation	Ranking
6	Financing company maintains the confidentiality of customer data from the legal	3.10	0.75	1
7	Financing company is committed to legislation and regulations necessary to implement e-business within the scope of Jordanian law	2.95	0.90	2
8	Financing company is committed to legislation and international laws concerning trade applications in banking and compliance with the Basel Committee	2.90	0.96	3
9	Available for the internal auditor familiar with the basic criteria in determining the legislative and legal actions with regard to electronic financing	2.75	0.98	4
10	Keep pace with the rapid developments in the Financing company legislation on e-commerce	2.70	0.65	5
Total Field / legislation and laws		**2.88**	**0.26**	**Medium**

Table no. (5) shows the degree of **legislation and laws** measurement in all paragraphs between medium to high, the arithmetic mean ranged between (2.70-3.10), paragraph (6) occupied the first rank, with the arithmetic mean of (3.10), and paragraph (10) occupied the last rank, with the arithmetic mean of (2.70) ,the arithmetic mean of the total field **/ legislation and laws** was(2.88) with a medium degree.

Table 6: Third field: Quality of Internal auditing (Dependent Variable) (n=120)

Number	Quality of Internal auditing	The Arithmetic Mean	Standard Deviation	Ranking
1	Experience of the internal audit team in the field of security and protection of customer data play a role in the quality of internal auditing	3.80	1.07	5
2	Knowledge of the laws of the nature of the internal auditors of e-commerce, local and international raise the quality of internal auditing in financing company	4.00	1.18	4
3	Speed of response by the auditors in the Auditing of customer data increases the quality of internal auditing in financing company	4.50	0.51	1
4	Commitment of internal auditors by the characteristics of accounting information and standards of the International Internal Audit (IIA's) have a positive impact in the quality of internal auditing in financing company	4.40	0.50	2
5	Adopt and understand the internal auditors of the activities of e-commerce issued by the Basel Committee contribute to increase the quality of internal auditing	4.20	0.41	3
Total Field / Quality of Internal audit		**4.18**	**0.39**	**High**

Table no. **(6)** shows that the degree of measuring the **Quality of Internal auditing** in all paragraphs is high, the arithmetic mean ranged between (3.80-4.50), paragraph (3) occupied the first rank, with the arithmetic mean of (4.50), and paragraph (1) occupied the last rank, with the arithmetic mean of (3.80). The arithmetic mean of the total field **/ Quality of Internal audit**ing was (4.18), which is a high degree.

8. Results of Testing the Hypotheses of the Study Using Multiple Regressions

Table 7: The results of testing multiple linear regression for the impact of Security and protection, legislation and laws on the quality of Internal auditing (N=120)

Independent Variables	Calculated (T) Value	Statistical Significance (A)	Correlation Coefficient (R)	Determination Coefficient ($R^{2)}$	Regression Coefficient β	Standard Deviation Coefficient (Beta)	Calculated F Value	Statistical Significance
Security and protection	2.38	0.022 *	0.390	0.16	0.466	0.196	3.18	0.059
legislation and laws	- 0.65	0.541			-0.097	0.158		

* Fixed regression (2.575)
*Statistically significant at the significance level of (α=0.05)

Table no. (7) showed the results of testing the multiple linear regression for the impact of Security and protection , legislation and laws on the quality of internal auditing.

Table no. (7) showed that the value of (R) is (0.390), which indicates a medium correlation degree between Security and protection , legislation and laws on the quality of internal auditing. The value of (R Square) reached(16%) which is an acceptable value that explains the ability of Security and protection , legislation and laws on the quality of internal auditing. The value of (F) test was (3.18), which is not statistically significant value at the significance level of (α=0.05), thus it can be concluded that there was no significant impact of the independent variables on the quality of internal auditing combined.

8.1. First Variable (Security and Protection)

The value of (β) was (46.6%) and (T) value was (2.38), which is a positive value and statistically significant at the significance level of (α=0.05), this indicates the presence of traces of variable Security and protection on the quality internal auditing. That because of the effectiveness of Security and protection and strengthened their impact on the quality of internal auditing in financing companies operating in Jordan.

8.2. The Second Variable (Legislation and Laws)

The value of (β) (- 9.7%) and the value of (T) (- 0.65) which is a negative value in a statistically significant level of (α=0.05), this indicates that there is no impact to the variable of legislation and laws on quality of internal auditing, because of the weak impact for the legislation and laws on the quality of internal auditing in financing companies operating in Jordan.

9. Results

In light of the above, the study showed that there was no significant impact for the combined independent variables (Security and protection, legislation and laws) on the quality of internal auditing, while for each independent variable and its impact on the quality of internal auditing; it is clear as the following:

9.1 There is a significant impact for the Security and protection on quality of internal auditing in financing companies operating in Jordan with a high degree.

9.2 There is no significant impact of legislation and laws on the quality of internal auditing in financing companies operating in Jordan.

10. Recommendations

1. The decision-makers' interest in financing companies operating in Jordan should raise the level of Security and protection in order for the quality of internal auditing to affect positively in those companies.
2. The influential people working in financing companies should reduce pressure on internal auditors, And increasing the auditors, which impacts positively on the quality of internal audit those companies.
3. Researchers and academics should be interest in making further studies that will upgrade the quality and effectiveness of the internal audit, taking into account other internal control to e-commerce activities.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Interest Rate Elasticity of Demand for Money in Ghana

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Abstract

The study sets out to examine the elasticity of demand for money to interest rate in Ghana during the period 1970 to 2010. In line with this objective, a theoretical model of demand for money function was specified with interest rate as the key independent variable. Other independent variables included are real income, general price level and exchange rate depreciation. The specified error-correction model was estimated by the Ordinary Least Squares (OLS) method based on Engel and Granger two-step estimation approach. Both the long-run cointegrated results and the short-run results have revealed that demand for money is sensitive to the interest rate. Furthermore, the CUSUMSQ test has revealed that the demand function of Ghana is not stable. The policy implications are that, the Ghanaian financial authorities should not focus only on using monetary policy to achieve price stability and growth of the country. The Bank of Ghana must combine the monetary policy with fiscal policy for the desired impact. For example, fiscal discipline by way of avoiding excessive budget deficits will combine effectively with monetary policy to achieve a sound monetary policy in the country.

Keywords: Interest rate elasticity, demand for money, theories of demand for money, stationarity test, cointegration test, stability of demand for money function.

1. Introduction

The concept of "demand for money" has over the years attracted the interest of economists both in developed and developing countries. Unlike the demand for goods, it is not restricted to one market but also involves other markets (Money market, capital market, commodity market and foreign exchange market), hence it has a direct bearing on monetary policy and so relevant to the study of macroeconomics (Bitrus, 2011).

The focus on the demand for money is attributed to the fact that monetary policy will only be effective if demand for money function is stable (Friedman, 1956). Stability of the demand for money function is crucial in understanding the behaviour of critical macroeconomic variables (Essien, Onwioduokit and Osho, 1996).

The importance of the relationship that exists between interest rate and demand for money cannot be over-emphasized. The interest rate also plays a crucial role in the efficient functioning of the money market, capital market, commodity market and exchange rate market as we have noted for demand for money. Thus, the interest rate and demand for money interact in the above types of financial markets to promote the efficient functioning of macroeconomic stability and economic growth. In other words, the relationship between interest rate and demand for money determines the efficacy or other wise of monetary and fiscal policies in an economy. For example, monetary policy is

relatively strong (has big effect on output) when an expansionary monetary policy leads to a fall in interest rates by a large amount and stimulates investment and net exports in a big way (Ahiawodzi, 2011).

The stability of financial markets is also fostered by interest rate stability, because fluctuations in interest rates create great uncertainty for financial institutions. An increase in interest rates produces large capital losses on long-term bonds and mortgages. Interest rate fluctuations have also been a particular severe problem for savings and loan associations and mutual savings banks, many of which got into serious financial trouble in the 1980s and early 1990s. The effectiveness of the interest rate policy as an indirect monetary policy also hinges on the stability of the demand for money function.

Ghana since 1988 has embarked upon vigorous Economic Recovery Programme (ERP) to resuscitate the economy. An integral part of the ERP is the Financial Sector Reform programme launched in 1988. The reforms were meant to reinvigorate the financial sector in order to function effectively and power the growth of the real sector of the economy. An integral part of the financial sector reform in Ghana is the interest rate liberalisation in accordance with McKinnon and Shaw (1973) theories.

The liberalisation of the interest rate involved the deregulation of interest rates (both deposit and lending rates) in order to reduce the high level of the financial market distortion, and to encourage competition among the banks. Consequently, it was expected that financial intermediation would improve, leading to increased mobilisation and allocation of resources in the financial sector in particular and in the economy as a whole. Thus, the prescription of Commercial banks' borrowing and lending rates ceased, except for savings deposit rate which was temporarily maintained at 21.5 percent. By March 1989, the commercial banks were given the full authority to determine their own rates and display them in their banking halls. Furthermore, in November 1990 the 20 percent mandatory lending to agriculture was abolished, and by the beginning of 1991, the Ghanaian financial sector was almost liberalised.

As a result, the nominal deposit (savings) rate increased from 16.5 percent in 1988 to 35.76 percent in 1997, dropped to 25.2 percent in 2000 and dropped significantly to 9.5 percent in 2008. The nominal lending rate also shot up from 25.58 percent in 1988 to 42.0 percent in 1997, fell to 38.5 percent in 2000 and further to 25.0 percent in 2008. The corresponding real savings (deposit) rates were –14.9 percent in 1988, 7.96 percent in 1997, -4.0 percent in 2000 and -12.92 in 2008. Whiles the real lending rates were –5.82 percent in 1988, 14.2 percent in 1997, 12.9 percent in 2000 and 6.92 in 2008.

Financial deepening unlike the pre-FINSAP period, has fairly assumed an increasing trend during the Financial Reforms period. It was 17.6% in 1993, 23% in 1998 and rose to 47% in 2008. As part of the financial sector reforms the Bank of Ghana since 1983 has also embarked upon concerted efforts towards achievement of macroeconomic stability (significant reduction in growth of money supply and inflation) by establishing institutions and adopting various monetary policy strategies. For example, the Monetary Policy Committee (MPC) was established in 2002. The Bank of Ghana has also adopted the Monetary Targeting policy, all with the view to reducing money supply to tolerable growth level.

Key monetary indicators such as broad money to Gross Domestic Product (GDP) ratio often used in gauging the extent of financial deepening in an economy point to significant deepening of the Ghanaian financial system over the past couple of decades. This has however happened with broadly unchanged interest rates spreads, a situation that has triggered the pursuit of vigorous market competition policies by the Central Bank. In the process, money supply (M3), rose consistently from an average of 17.2 percent of GDP during 1990-1995 to 45.8 percent at end-2008. This was reflected in a strong deposit mobilization over the period, rising significantly from some 11.1 percent of GDP during 1990 – 1995 to 36.3 percent of GDP at end 2008. The strong deposit mobilization supported increased growth of bank credit to the private sector from under 10 percent of GDP during the 1996 – 2000 to 27.7 percent of GDP by 2008. Currency outside banks remained broadly unchanged at an average of some 7.6 percent GDP over the period (Bawumia, 2010).

The cardinal issue facing the Ghanaian economy is how to maintain money supply level that will foster monetary and macroeconomic stability in the country for the needed growth. The interest rate is known to be a crucial variable in the conduct of monetary policy. The question that readily comes to mind is how sensitive is the demand for money to the interest rate in Ghana in a bid to achieving effective monetary policy in the country? This is the concern of this research.

The main objective of the study is to examine the effect of the prevailing interest rate on demand for money in Ghana and to make the necessary policy recommendations.

Hypotheses

In line with the objectives of the study, the following hypotheses were stated by the researcher.

i. Demand for money is not sensitive to the interest rate in Ghana.
ii. The demand for money function is not stable in Ghana

The paper is divided into five sections: Section one is the introduction which touches on background of the study including objectives and hypotheses of the study. This is followed by literature review in section two. Both theoretical and empirical literature on the topic has been reviewed. Section three is on the methodology involving specification of the model, estimation and evaluation techniques as well as data sources. Section four looks at the empirical results of the specified model and interpretation of the results. The last section is on conclusion and policy implications.

2. Literature Review

2.1. Theories of Demand for Money

2.1.1. The Quantity Theory of Money

The Quantity Theory of Money states that the *nominal income is determined solely by movements in the quantity of money.* Developed by the classical economists in the nineteenth and early twentieth centuries, the quantity theory of money is a theory of how the nominal value of aggregate income is determined. The classical theories were refined at the start of the twentieth century by economists such as Irving Fisher, Alfred Marshall, and A.C. Pigou. *Since it also tells us how much money is held for a given amount of aggregate income, it is a theory of the demand for money.* The most important feature of this theory is that it suggests that interest rates have no effect on the demand for money (Mishkin, 2007).

Velocity of Money

The clearest exposition of the classical quantity theory approach is found in the work of the American economist Irving Fisher, in his influential book *The Purchasing Power of Money*, published in 1911. Fisher wanted to examine the link between the total quantity of money (M) and the total amount of spending on final goods and services produced in the economy (P x Y), where P is the price level and Y is aggregate output (income). The concept that provides the link between M and P x Y is called the **velocity of money** (often reduced to velocity), the average number of times per year (turnover) that a cedi is spent in buying the total amount of goods and services produced in the economy. Velocity (V) is defined more precisely as total spending P x Y divided by the quantity of money (M):

$$V = \frac{P \times Y}{M} \tag{1}$$

If, for example, nominal GDP (P x Y) in a year is GH¢5 trillion and the quantity of money is GH¢ 1 trillion, velocity is 5, meaning that the average Cedi bill is spent five times in purchasing final goods and services in the economy.

Equation of Exchange

By multiplying both sides of this definition in equation (1) by M, we obtain the **equation of exchange**, which relates nominal income to the quantity of money and velocity:

$$M \times V = P \times Y \quad (2)$$

The equation of exchange thus states that the quantity of money multiplied by the number of times that this money is spent in a given year must equal nominal income (the total nominal amount spent on goods and services in that year).

As it stands, Equation (2) is nothing more than an identity – a relationship that is true by definition. It does not tell us, for instance, that when the money supply (M) changes, nominal income (P x Y) changes in the same direction; a rise in M, for example, could be offset by a fall in V that leaves M x V (and therefore P x Y) unchanged. To convert the equation of exchange (an identity) into a theory of how nominal income is determined requires an understanding of the factors that determine velocity.

Determinants and Constancy of Velocity

Irving Fisher reasoned that velocity is determined by the institutions in an economy that affect the way individuals conduct transactions. If people use charge accounts and credit cards to conduct their transactions, as they can today, and consequently use money less often when making purchases, less money is required to conduct the transactions generated by nominal income (M falls relative to P x Y), and velocity (P x Y) / M will increase. Conversely, if it is more convenient for purchases to be paid for with cash or cheque (both of which are money), more money is used to conduct the transactions generated by the same level of nominal income, and velocity will fall. Fisher took the view that the institutional and technological features of the economy would affect velocity only slowly over time, so velocity would normally be reasonably constant in the short run.

Quantity Theory of Money

Fisher's view that velocity is fairly constant in the short run transforms the equation of exchange into the **quantity theory of money**, *which states that nominal income is determined solely by movements in the quantity of money: when the quantity of money (M) doubles and so must P x Y, the value of nominal income*.

Since the classical economists (including Fisher) thought that wages and prices were completely flexible, they believed that the level of aggregate output (Y) produced in the economy during normal times would remain at the full – employment level, so Y in the equation of exchange could also be treated as reasonably constant in the short run. The quantity theory of money then implies that if M doubles, P must also double in the short run, because V and Y are constant (that is $M \times \bar{V} = P \times \bar{Y}$).

For the classical economists, the quantity theory of money provided an explanation of movements in the price level: *Movements in the price level result solely from changes in the quantity of money.*

Quantity Theory of Demand for Money Derived

Since the quantity theory of money tells us *how much money is held for a given amount of aggregate income,* it is in fact, a theory of money demand or demand for money. We can see this by dividing both sides of the equation of exchange (equation 2) by V, thus rewriting it as:

$$M = \frac{1}{V} \times PY$$

Where nominal income P x Y is written as PY. When the money market is in equilibrium, the quantity of money (M) that people hold equals the quantity of money demanded (M^d), so we can replace M in the equation by M^d. Using k to represent the quantity 1/V (a constant, because V is a constant), we can rewrite the equation as:

$$M^d = k \times PY \quad (3)$$

Equation (3) tells us that because k is a constant, the level of transactions generated by a fixed level of nominal income (PY) determines the quantity of money (M) that people demand. Therefore, Fisher's quantity theory of money suggests that the *demand for money is purely a function of income*, *and interest rates have no effect on the demand for money*.

Fisher came to this conclusion because he believed that people hold money only to conduct transactions and have no freedom of action in terms of the amount they want to hold. The demand for money is determined (i) by the level of transactions generated by the level of nominal income (PY) and (ii) by the institutions in the economy that affect the way people conduct transactions and thus determine velocity and hence k (Mishkin, 2007). It must be pointed that the constancy of velocity became questionable during the Great Depression.

2.1.2. The Keynesian Theory of Demand for Money

In his famous 1936 book: *The General Theory of Employment, Interest, and Money*, John Maynard Keynes abandoned the classical view that velocity was a constant and developed a theory of money demand that emphasized the importance of interest rates. His theory of the demand for money, which he called the *Liquidity Preference Theory*, asked the question: Why do individuals hold money? He postulated that there are three motives behind the demand for money: the transactions motive, the precautionary motive, and the speculative motive.

a) Transactions Motive

In the classical approach, individuals are assumed to hold money because it is a medium of exchange that can be used to carry out everyday transactions. Following the classical tradition, Keynes emphasized that this component of the demand for money is determined primarily by the level of people's transactions. Since he believed that these transactions were proportional to income, like the classical economists, he took the transactions component of the demand for money to be proportional to income.

b) Precautionary Motive

Keynes went beyond the classical analysis by recognizing that in addition to holding money to carry out current transactions, people hold money as a cushion against an unexpected need, such as payment of hospital bills.

Keynes believed that the precautionary money balances people want to hold are determined primarily by the level of transactions that they expect to make in the future and that these transactions are proportional to income. Therefore, he postulated, the demand for precautionary money balances is proportional to income.

c) Speculative Motive

If Keynes had ended his theory with the transactions and precautionary motives, income would be the only important determinant of the demand for money, and he would not have added much to the classical approach. However, Keynes took the view that people also hold money as a store of wealth. He called this reason for holding money the *speculative motive.* Since he believed that wealth is tied closely to income, the speculative component of money demand would be related to income. However, Keynes looked more carefully at other factors that influence the decisions regarding how much money to hold as a store of wealth, especially interest rates. The interest rate in the view of Keynes may be regarded as the cost of holding money. Thus, as interest rates rise, the demand for money falls, and therefore money demand is negatively related to the level of interest rates.

The Liquidity Preference Function

In putting the three motives for holding money balance together into a demand for money equation, Keynes was careful to distinguish between nominal quantities and real quantities. Money is valued in terms of what it can buy. If, for example, all prices in the economy double (the price level doubles), the same nominal quantity of money will be able to buy only half as many goods. Keynes thus reasoned that people want to hold a certain amount of real money balances (the quantity of money in real terms)

– an amount that his three motives indicated would be related to real income (Y) and to interest rates (r). Keynes wrote down the following demand for money equation, known as the liquidity preference function, which says that the demand for real money balances M^d/P is a function of r and Y.

$$\frac{M^d}{p} = f(r, Y) \quad (4)$$

The minus sign below r in the liquidity preference function means that the demand for real money balances is negatively related to the interest rate (r), and the plus sign below Y means that the demand for real money balances and real income (Y) are positively related. This money demand for real money balances and real income Y are positively related.

Liquidity Preference Function for Velocity

By deriving the liquidity preference function for velocity; V = PY/M, we can see that Keynes's theory of the demand for money implies that velocity is not constant, but instead fluctuates with movements in interest rates. The liquidity preference equation can be rewritten as follows (first, find the inverse of equation 4).

$$\frac{P}{M^d} = \frac{1}{f(r, Y)} \quad (5)$$

Multiply both sides of equation (5) by Y and recognizing that M^d can be replaced by M because they must be equal in money market equilibrium, we solve for velocity:

$$\frac{PY}{M} = \frac{Y}{f(r, Y)} \quad (6)$$

But $V = \frac{PY}{M}$

Hence $V = \frac{Y}{f(r, Y)}$ (7)

We know that the demand for money is negatively related to interest rates; when r goes up, f(r, Y) declines, and therefore velocity rises. In other words, a rise in interest rates encourages people to hold lower real money balances for a given level of income; therefore the rate at which money turns over (velocity) must be higher. This reasoning implies that because interest rates have substantial fluctuations, the liquidity preference theory of the demand for money indicates that velocity has *substantial fluctuations* as well.

2.1.3. Friedman's Modern Quantity Theory of Money

In 1956, Milton Friedman developed a theory of the demand for money in a famous article, "The Quantity Theory of Money: A Restatement". Although Friedman frequently refers to Irving Fisher and the quantity theory, his analysis of the demand for money is actually closer to that of Keynes.

Like his predecessors, Friedman pursued the question of why people choose to hold money. Instead of analyzing the specific motives for holding money as Keynes did, *Friedman simply stated that the demand for money must be influenced by the same factors that influence the demand for any asset*. Friedman then applied the theory of asset demand to money.

The theory of asset demand indicates that the demand for money should be a function of the resources available to individuals (their wealth) and the expected returns on other assets relative to the expected return on money. Like Keynes, Friedmen recognized that people want to hold a certain amount of real money balances (the quantity of money in real terms). From this reasoning, Friedman expressed his formulation of the demand for money as follows:

$$\frac{M^d}{P} = f(Y_p, r_b - r_m, r_e - r_m, \pi^e - r_m \quad (7)$$

Where M^d/P = demand for real money balances

Y_p = Friedmen's measure of wealth, known as permanent income (technically, the present discounted value of all expected future incomes, but more easily described as expected average long – run income.

r_m = expected return on money

r_b = expected return on bonds

r_e = expected return on equity (common stocks)

π^e = expected inflation rate

The signs underneath the equation indicate whether the demand for money is positively (+) related or negatively (-) related to the terms that are immediately above them.

Let us look in more detail at the variable in Friedman's wealth concept, permanent income (indicated by the plus sign beneath it). Unlike our usual concept of income, permanent income (which can be thought of as expected average long – run income) has much smaller short run fluctuations, because many movements of income are transitory (short –lived). For example, in a business cycle expansion, income increases rapidly, but because some of this increase is temporary, average long – run income does not change very much. Hence in a boom, permanent income rises much less than income. During a recession, much of the income decline is transitory, and average long – run income (hence permanent income) falls less than income. One implication of Friedman's use of the concept of permanent income as a determinant of the demand for money is that the demand for money will not fluctuate much with business cycle movements.

An individual can hold wealth in several forms besides money. Friedman categorized them into three types of assets: bonds, equity (common stocks), and goods. The incentives for holding these assets rather than money are represented by the expected return on each of these assets relative to the expected return on money (r_m), the last three terms in the money demand function. The minus sign beneath each indicates that as each term rises, the demand for money will fall.

The terms $r_b - r_m$ and $r_e - r_m$ represent the expected return on bonds and equity relative to money; as they rise, the relative expected return on money falls, and the demand for money falls. The final term, $\pi^e - r_m$, represents the expected return on goods relative to money. The expected return from holding goods is the expected rate of capital gains that occurs when their prices rise and hence is equal to the expected inflation rate π^e. If the expected inflation rate is 10%, for example, then goods prices are expected to rise at a 10% rate, and their expected return is 10%. When $\pi^e - r_m$ rises, the expected return on goods relative to money rises, and the demand for money falls.

Nonconstancy of the Expected Return on Money

Friedman did not take the expected return on money to be a constant in discussing his demand for money function as Keynes did. When interest rates rise in the economy, banks make more profits on their loans, and they want to attract more deposits to increase the volume of their now more profitable loans. If there are no restrictions on interest payments on deposits, banks attract deposits by paying higher interest rates on them. Since the industry is competitive, the expected return on money held as bank deposits then rises with the higher interest paid on deposits. The net result of this competition in the banking industry is that $r_b - r_m$ stays *relatively constant* (as well as r_e-r_m and $\pi_e - r_m$) when the interest rate r rises.

Unlike Keynes's theory, which indicates that interest rates are an important determinant of the demand for money, Friedman's theory suggests that changes in interest rates should have little effect on the demand for money.

Therefore, Friedman's money demand function is essentially one in which permanent income is the primary determinant of money demand, and his money demand equation can be approximated by:

$$\frac{M^d}{P} = f(Y_p) \tag{8}$$

Stability of Demand for Money Function

Also Friedman stressed the stability of the demand for money function. In contrast to Keynes, Friedman suggested that random fluctuations in the demand for money are small and that the demand for money can be predicted accurately by the money demand function. When combined with his view that the demand for money is insensitive to changes in interest rates, this means that velocity is highly predictable. We can see this by writing down the velocity that is implied by the money demand equation (Equation 8):

Find the inverse of equation (8). This gives you:

$$\frac{P}{M^d} = \frac{1}{f(Y_p)} \tag{9}$$

Multiply through by Y

$$\frac{PY}{M^d} = \frac{PY}{M} = \frac{Y}{f(Y_p)} \tag{10}$$

But $\frac{PY}{M} = V$

Hence we have:

$$V = \frac{Y}{f(Y_p)} \tag{11}$$

Since the relationship between Y and Yp is usually quite predictable, a stable money demand function (one that does not undergo pronounced shifts, so that it predicts the demand for money accurately) implies that velocity is predictable as well. If we can predict what velocity will be in the next period, a change in the quantity of money will produce a predictable change in aggregate spending. *Even though velocity is no longer assumed to be constant, the money supply continues to be the primary determinant of nominal income as in the quantity theory of money. Therefore, Friedman's theory of money demand is indeed a restatement of the quantity theory, because it leads to the same conclusion about the importance of money to aggregate spending.*

(Mishkin, 2007).

2.2. Empirical Literature

A considerable body of literature has investigated the demand for money in developing counties (Wong, 1977), Arize 1989, Gupta and Moazzami (1989), Arrau (1991), Bahmani – Oskooee and Malixi (1991), Simmons (1992) and Friram (2000). For example Arize (1989) estimated the demand for money in four Asian economies: Pakistan, the Phillippines, South Korea, and Thailand. He argued that the foreign interest rate, exchange rate depreciation and technological change are important determinants of the Asian money demand functions.

Arango and Nadiri (1981), undertook a study on demand for money in open economies involving Canada, Germany, United Kingdom and United States from 1960 to 1975. They specified a multiple regression model based on the portfolio model of financial market. The results of the study revealed that the demand for money is affected not only by changes in domestic variables such as permanent income, domestic interest rate and price expectations, but also` fluctuations in exchange rate expectations and foreign interest rates.

Many studies have considered the general process of financial asset substitution and justified the use of an exchange rate and foreign interest rate in the analysis of the demand for money. These include, among others Bahmani – Oskooee and Phee (1994), Traa (1991) and Chowdhury (1995). All these studies are clearly in favour of both currency substitution. Consequently, it is very important to include the real effective exchange rate and a measure of the foreign real interest rate in the money demand function.

Bahmani – Oskooee and Malixi (1991) estimated the demand for money function in 13 developing countries as a function of inflation, real income and the real effective exchange rate. They

concluded that, ceteris paribus, a depreciation in real effective exchange rate results in a fall in the demand for domestic currency.

Simmons (1992) employed an error-correction model to estimate the demand for money in five African economies. The study emphasized the role of opportunity cost variables including the domestic interest rate and expected exchange rate depreciation. His empirical results indicate that the domestic interest rate is an important determinant of the demand for money functions for three of the five countries, whereas external opportunity cost variables are significant for only one of the others.

Andoh and Chappell (2002) estimated the demand for money in Ghana for the period 1960 to 1996. Their hypothesis was that the different macroeconomic adjustment policies (privatization, removal of foreign and domestic controls) which began in the mid 1980s would alter the demand for money function. They specified an error correction model with the demand for money (M2) being the dependent variable. The included variables were real per capital income, interest rate and inflation rate. The results of the study showed a structural break in the demand for money function in 1983.

However, their study could be criticized for treating Ghana as a closed economy, because they did not include any open economy index such as exchange rate or trade openness index.

Mannah-Blankson and Belnye (2004) examined the impact of Financial Innovation Resulting from the Financial Sector Adjustment Programme (FINSAP) launched in September 1987 in Ghana on money demand using cointegration and error correction modeling. The independent variable of their model were real income, exchange rate, inflation rate and financial innovation proxy. The results of their study demonstrated that the development of the economy's transaction technology overtime has indeed had an impact on the demand for real money balances. Much as their study could be commended for the robustness of the economic techniques, it is quite evident that the study did not take explicit account of the interest rate variable, which is an important variable in the current study.

Owoye and Onafowor a, (2007), Writing on: 'M2 targeting, money demand and real GDP growth in Nigeria: Do the rules apply?' opined that economic agents may hold money either as an inventory to smooth difference between income and expenditures, or for the yield as an asset in portfolio. According to them, either motive suggests a specification in which the demand for money depends on a scale variable such as real income or credits and the rates of returns to money and that of alternative assets.

Valadkhani (2008), examined the long-run and short-run determinants of the demand for money in six countries in the Asian – Pacific region using panel data (1975-2002). Various countries – specific coefficients were used to capture inter-country heterogeneities. The results of the study indicated that the demand for money in the long-run positively responded to real income, and in largely to the interest rate spread, inflation, the real effective exchange rate, and the US real interest rate. Furthermore, the long-run income elasticity is greater than unity and also both the currency substitution and capital mobility hypothesis hold only in the long-run.

According to Kuma et al. (2011), many developing countries have underdeveloped, undiversified financial markets that lack financial sector instruments and payment technologies such that most transactions involve the use of narrow money, hence one should expect income elasticity slightly above unity. Anoruo (2002), Akinlo (2005), Owoye and Onafowora (2007) and Nwafor et al. (2007) found income elasticities of 5.70, 1.094, 2.067 and 5.430, respectively for Nigeria while Bamat (1986), Nell (2003) and Drama and Yao (2010) found income elasticities of 1.843, 1.480 and 5.312 respectively for Kenya, South Africa and Cote d'Ivoire.

Bitrus (2011) examined the determinants of the demand for money in developed and developing countries. The study employed a comparative analysis of the effectiveness of the determinants of the demand for money in both developing and developed countries. The study found out that income related factors or the scale variables are more effective in developing countries, while factors that work through the financial system are more effective in the developed economies and that stock market variables should not be ignored in modeling demand for money even in emerging economies since they constitute an alternative to holding cash.

Asuamah, Tandoh and Mahaniiya (2012) estimated the demand for money in Ghana using autoregressive distributed lag (ARDL) approach to cointegration analysis to determine if there is a stable long-run money demand function in order to contribute to the existing body of knowledge in money demand empirically. The results of their study showed that there is a unique cointegrated but not a stable long-run relationship among M2+ monetary aggregates, inflation and exchange rate and GDP. Their results passed the CUSUM test but did not pass the CUSUMSQ test which shows that there is no stable, demand for money function in Ghana. However their study lacked the interest rate as an important variable in the specification of their model.

From the foregoing it is clear that even though a number of empirical studies have been done on the determinants of the demand for money, they are quite general and cannot be applied to each country without significant modification. It has been noted that the empirical studies on Ghana have either failed to explicitly include the interest rate as an important monetary policy variable, or treated the country like a closed economy. The current study therefore takes account of these draw backs with a focus on the specific relationship between demand for money and interest rate in Ghana.

3. Methodology

3.1. Specification of the Model

Based on the literature, a theoretical model of demand for money was specified, taking into account the Classical, Keynesian and Friedman theories of demand for money. The model follows closely the Bitrus (2011) model of demand for money, but with modifications to suit the Ghanaian economy. Thus, the specified econometric model has demand for money (DM) as the dependent variable. The included variables are interest rate (IR), real income (RY), the general price level (CPI) and exchange rate depreciation (ERD). In order to reduce heteroscedasticity and to get the appropriate functional form of the specified model, the logarithm (L) of the variables was taken. The advantage in the use of the logarithm is also to get the estimated parameters come out as respective partial elasticities.

Thus in a general form the model is:

$$LDM = f(LIR, LRY, LCPI, LERD) \tag{12}$$

Assuming a log linear relationship between demand for money and the included variables, equation (12) becomes:

$$LDM_t = \delta_0 + \delta_1 LIR_t + \delta_2 LRY_t + \delta_3 LCPI_t + \delta_4 LERD_t + u_t \tag{13}$$

Equation (13) is the static or long-run model estimated.

3.1.1. Error-Correction Model Approach

In order to avoid spurious parameter estimates if the variables are trended, equation (13) is transformed into an Error-correction model (see Harris, 1995). Thus, assuming all the variables are non-stationary of order (I(1), the error-correction transformation is as follows:

$$\Delta LDM_t = \theta_0 + \theta_1 \Delta RIR_t + \theta_2 \Delta LRY_t + \theta_3 \Delta LCPI_t + \theta_4 \Delta LERD_t + \theta_5 [LDM_{t-1} - (\delta_0 + \delta LIR_t + \theta_2 LRY_t + \theta_3 LCPI_t + \theta_4 LERD_t)_{-1}] + u_t \tag{14}$$

$$\Delta LDM_t = \theta_0 + \theta_1 \Delta RIR_t + \theta_2 \Delta LRY_t + \theta_3 \Delta LCPI_t + \theta_4 \Delta LERD_t + \theta_5 (LDM_{t-1} - \delta_0 - \delta LIR_{t-1} - \theta_2 LRY_{t-1} - \theta_3 LCPI_{t-1} - \theta_4 LERD_{t-1}) + u_t \tag{15}$$

$$\Delta LDM_t = \theta_0 + \theta_1 \Delta RIR_t + \theta_2 \Delta LRY_t + \theta_3 \Delta LCPI_t + \theta_4 \Delta LERD_t + \theta_5 ECM_{t-1} + u_t \tag{16}$$

Where ECM_{t-1} is lagged error correction term (laggegd residuals of the static model) and captures the speed of adjustment coefficient. The speed of adjustment coefficient gives the proportion of the disequilibrium between the short-run and long-run values of demand for money that is eliminated in one period. Equation (16) is the dynamic or short-run model which was also estimated.

The expected signs are:

$$\theta_0 < / > 0, \theta_1 < 0, \theta_2 > 0, \theta_3 > 0, \theta_4 < / > 0; \theta_5 < 0$$

3.2. Justification and Measurement of the Variables

3.2.1. Demand for Money

This is the dependent variable and is defined as the quantity of money that people would want to hold at any point in time. It is broad definition of money (M2+) that is used in this study. The M2+ comprises the summation of Demand deposits, savings deposits, time deposits and foreign currency deposits with the Banks.

3.2.2. Level of Income

The major determinant of a nation's demand for money is the volume of payments that must be undertaken. A good measure of the volume of payments is the level of national income (Y). All other things being equal, the higher the level of income, the greater the need for money and, hence the greater the demand for money and vice versa.

3.2.3. Nominal Interest Rate

The nominal interest rate matters for the demand for money because it is the opportunity cost that households and firms face for holding wealth in the form of money. Money bears a zero nominal interest rate and holding it implies foregoing that nominal interest rate. Higher interest rates discourage the holding of wealth in the form money, therefore a negative relationship between money demand and nominal interest rate is expected in line with Keynesian theory.

3.2.4. The General Price Level

Money is valued for its purchasing power, and this purchasing power is measured by the price level. With increased prices people increase their demand for money. Therefore a positive relationship is expected. The Consumer Price Index (CPI) is used as a proxy for the general price level in this study.

3.2.5. Exchange Rate Depreciation

The return on the holdings of foreign assets will be influenced by the expectation of exchange rate movements (Essien et al., 1996). According to them, depreciation of the domestic currency relative to foreign currencies would lead to a rise in the return of foreign assets to domestic holders and vice versa. This implies that as the Ghanaian Cedi depreciates greatly against the major hard currencies, currency substitution would increase, and as a result demand for Ghanaian currency will fall and vice – versa.

3.3. Time Series Properties

Stationarity Test

The Augmented Dickey-Fuller (1979) technique was employed in checking the stationarity status of the variables.

Cointegration Test

Similarly, for cointegration status of the variables, a residual-based approach to testing for cointegration by using Augmented Dickey Fuller test as recommended by Engle and Granger (1987) was employed. The Johansen (1988) Maximum Likelihood (ML) approach to testing for cointegration could not be used owing to the inadequate number of observations.

Estimation Techniques

The Ordinary Least Squares (OLS) technique was used in estimating both short-run and long run models. Apart from its simplicity, it gives reliable estimates. The estimation software was Microfit Version 4.0.

3.4. Evaluation Techniques

Statistical techniques were used to evaluate the estimated specified model. The Adjusted coefficient of determination (R-bar squared) was used to test the best fit line. The R-bar squared also measures the explanatory power of the specified model. That is, the percentage in variation of dependent variable (LDM) explained by the independent variables.

The t-ratio was used to determine the significance of the stated variables. The F-Statistic was also used to test our stated hypothesis of the joint significance of the independent macroeconomic variables.

3.5. CUSUM and CUSUMSQ Tests

The cumulative sum (CUSUM) and the CUSUM of Squares (CUSUMSQ) tests were used to test the stability or otherwise of demand for money function in Ghana during the period.

3.6. Sources of Data

The secondary data used are time series data on the variables from 1970 to 2010. They were obtained from the following sources:

- Bank of Ghana Bulletins
- The State of the Ghanaian Economy, published by ISSER (various issues)
- Quarterly Digest of Statistics published by the statistical Service of Ghana

The above sources are the main sources where reliable data are gathered for any research project on Ghana.

4. Empirical Analysis

4.1. Stationarity Test Results

The Augmented Dickey-Fuller (1979) test results are shown in Tables 1 and 2 as follows:

Table 1: Unit Root Test for the Variables at the Levels.

Variables	Lag Length	Test Statistic	ADF 95% Critical Value	Order of Integration	Status
LDM	3	-0.062294	-3.5348	I(1)	Non-stationary
LIR	1	-1.5299	-3.5279	I(I)	Non-stationary
LRY	2	-1.8476	-3.5313	I(1)	Non-stationary
LCPI	2	-1.2581	-3.5313	I(1)	Non-stationary
LERD	1	-2.5740	-3.5313	I(1)	Non-stationary

Table 2: Unit Root Test at First Differences

Variables	Lag Length	Test Statistic	ADF 95% Critical Value	Order of Integration	Status
ΔLDM	1	-4.8750	-3.5313	I(0)	Stationary
ΔLIR	1	-5.4873	-3.5313	I(0)	Stationary
ΔLRY	2	-4.1384	-3.5348	I(0)	Stationary
ΔLCPI	1	-5.4873	-3.5348	I(0)	Stationary
ΔLERD	1	-4.6828	- 3.5313	I(0)	Stationary

The results above indicate that all the variables are non-stationary at the levels. They have unit roots of I(1), and so had to be differenced once to achieve stationarity.

4.2. Cointegration Test Results

The long-run Cointegration results based on the residual- based approach are shown in Table 3.

Table 3: Cointegration Regression Results of Demand for Money Function at the Levels (1970 to 2010)

Regressor	Coefficient	Standard Error	T-ratio	Probality Value
CONST	-5.8752	1.8695	-3.1427	(0.003)*
LIR	-0.44767	0.20709	-2.1617	(0.038)*
LRY	1.1262	0.24266	4.6412	(0.000)*
LCPI	1.0367	0.032144	32.2515	0.0000)*
LERD	-0.010790	0.74760	-0.14433	(0.886)

*Significant at 99% level of confidence

Summary Statistics

Test	Statistic
R-Bar-Squared	0.98932
F-statistic	904.0033(0.000)
Cointegration Statistic	ADF (1) = -6.1846(-3.5313)

Discussion of the Long-Run Cointegration Test Results

From the estimated long-run results in Table 3, it can be seen that all the test statistics support goodness of fit of the model. The R-Bar Squared of 0.98932 means that about 99% of the variations in demand for money (LDM) was explained by the independent variables (LIR, LRY, LCPI, LERD). The F-ratio is also statistically significant indicating that all the individual variables are jointly significant in determining the level of demand for money in Ghana.

Our target variable, the interest rate (LIR) bears the expected negative sign. It has a coefficient of negative 0.44767 and a t-ration of -2.1617, which is significant at 95% confidence level. The significance of the parameter estimate of the interest rate means that demand for money in Ghana is sensitive to the interest rate, with a long-run elasticity of -0.44767. We therefore fail to accept our stated hypothesis one that the demand for money is not sensitive to the interest rate in Ghana. Other significant variables are real income (LRY) and the general Consumer Price level (LCPI), except the exchange rate depreciation (LERD) which is not significant.

The variables are also cointegrated meaning there is a long-run equilibrium relationship among the variables. This is supported by cointegration statistic of ADF(1) = -6.1846 with a critical value of -3.5313.

4.3. The Short-run Results

The short-run (dynamic) parsimonious results of the Error Correction Model are contained in Table 4.

Table 4: The Short-run Private Inward Remittances Function Regression Parsimonious Results (1970 to 2010

Regressor	Coefficients	Standard Error	T-ratio	Probability Value
CONS	-0.037000	0.16074	-0.23019	0.819
ΔLIR	-0.88527	0.27346	-3.2373	0.003*
ΔLRY	0.64105	0.31149	2.0580	0.0.051**
ΔLCPI	1.2421	0.48693	2.5508	0.016*
ΔLERD	0.0093085	0.0623293	0.14935	0.882
ECM(-1)	-1.1497	0.17887	-6.4275	0.000*

*Significant at 99% confidence level

**Significant at 95% confidence level

Summary Statistics

Test	Statistic
R-Bar-Squared	0.74598
F-statistic	F (5, 32) = 9.8989(0.000)
DW-statistic	2.0046

Diagnostic Tests

Test Statistic	LM Version	F Version
A: Serial Correlation	CHSQ (1) = 0.40585(0.524)	F (1, 31) = 0.33466 (0.567)
B: Functional Form	CHSQ (1) =0.0087706 (0.925)	F (1, 31) = 0.0071566 (0.933)
C: Normality	CHSQ (2) = 45.0487(0.213)	Not applicable
D: Heteroscedascity	CHSQ (1) = 0.29358 (0.588)	F (1,36) = 0 .28029 (0.066)

Discussion of the Short-run Results

From Table 4 it can be seen that all the evaluation techniques are satisfactory, with an R- bar-Squared 0.74598 which is quite high and indicates a good fit. The F-ratio of 9.8989 (0.000) is highly significant with a probability ratio of 0.000. The significance of the F- ratio again indicates that all the independent variables are jointly significant in determining demand for money in Ghana. The best of the results was achieved for all the variables at their first differences without any lags.

The Dubin- Watson statistic of 2.0046 is approximately 2.0 and indicates that successive error terms are not correlated (absence of autocorrelation).

We see from Table 4 that all the diagnostic tests: Serial Correlation, Functional form, Normality and Heteroscedasticty have performed well (they are all not significant). These lend credence to the validity and reliability of the parameter estimates.

Generally, the short-run results follow the pattern of the long-run results. The coefficient of the interest rate (LIR) continues to be significant and negatively signed. Its T-ratio of -3.2373 is significant at 99 percent level of confidence. Thus the short-run coefficient of elasticity of interest rate to demand for money is -0.88527 (which is slightly above the long-run one). However, the estimated long-run and short-run coefficients of the interest rate is less than unity in both cases. The significance of the short-run parameter estimate of the interest rate buttresses up the long-run conclusion that the demand for money is sensitive to the interest rate in Ghana. Here again, we fail to accept our stated first hypothesis that demand for money is not sensitive to the interest rate in Ghana. The results are thus consistent with the results of Arango and Nadiri (1981), Simmons (1992), Valadkhani (2008) and Asuanmah, Tandoh and Mahaniya (20012).

The real income variable (LRY) is significant for both long-run and short-run results with the expected positive sign. It is quite clear that demand for money in Ghana is mainly explained by the Keynesian theory of demand for money. The general price level (LCPI) also positively and significantly affects demand for money in Ghana in both long-run and short-run. This means that as the general price level rises, people demand more money in order to make their purchases. The parameter estimate for the exchange rate depreciation is not significant in both cases, and also has opposing signs.

The lagged-error correction term: ECM (-1) is statistically significant at 99% confidence level and appropriately negatively signed. Its t-ratio is -6.4275. The significance of the lagged error term implies that any short-run disequilibrium of the demand for money adjusts towards the long-run equilibrium position. It also confirms that there is a long-run equilibrium relationship among the variables.

4.4. Stability of the Demand for Money Function

The results of the CUSUM and CUSUMSQ tests for stability or otherwise of the demand for money function in Ghana are graphically shown below:

Figure 1: CUSUM test

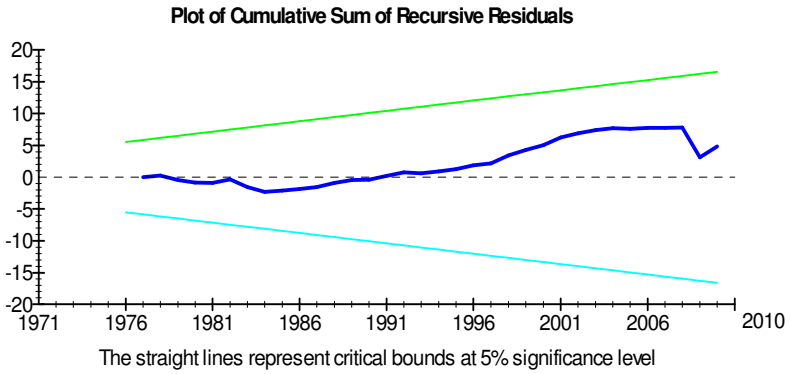
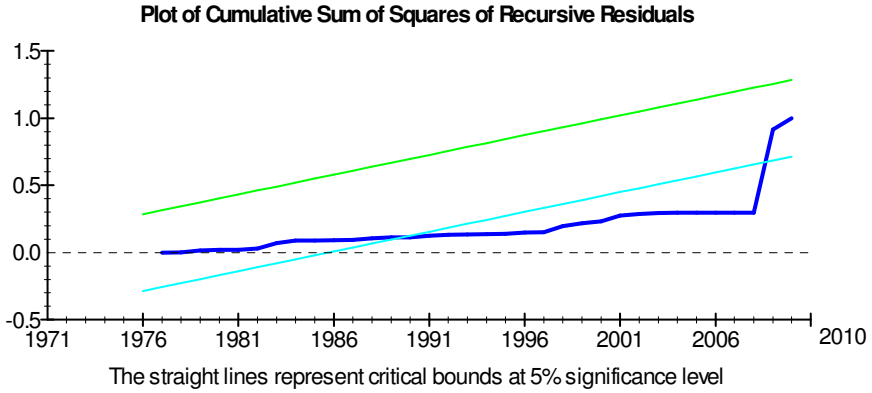


Figure 2: CUSUMSQ Test



From the graphs above, it is seen that, while the CUSUM test shows stability, the CUSUMSQ test indicates instability of the demand function from approximately 1990 to 2008. Since the CUSUMSQ test is more powerful, we conclude that the demand for money function is not stable in Ghana during the period under study. Thus, we fail to reject our stated second hypothesis that the demand for money function is not stable in Ghana. This revelation is consistent with Kumah et. al. (2011) and Asuamah, Tandoh and Mchaniya (2012).

5. Conclusions

5.1. Summary

This study examined the elasticity of the interest rate to demand for money as well as the stability of the demand function in Ghana for the period 1970 to 2010. Based on the literature, a theoretical log linear model of demand for money was specified. The specified model has demand for money (LDM) as the dependent variable in an error-correction fashion. The independent variables included nominal interest rate (LIR), real income (LRY), The general price level and exchange rate depreciation (LERD) .

The Augmented Augmented Dickey-Fuller (1979) test revealed that all the variables were trended (non stationary) with a unit root of I(1) and so had to be differenced once. Both the long-run and short-run versions were estimated using the Ordinary Least Squares Regression technique involving a two-step Engel and Granger error-correction approach.

Both the long-run and short-run results revealed that demand for money is sensitive to the interest rate in Ghana, with long and short-run coefficients of elasticity less than unity. We therefore failed to accept our stated hypothesis that, demand for money is not sensitive to the interest rate in Ghana. The CUSUMSQ test revealed that the demand function is not stable in Ghana during the approximate period of 1990 to 2008. Other significant variables are, real income (LRY) and the general

price level (LCPI). Generally, the results of this study are consistent with Arango and Nadiri (1981), Simmons (1992), Andoh and Chappel (2002), Valadkhani (2008), Kumah et.al. (2011), Asuamah, Tandoh and Mahaniya (2012).

5.2. Policy Implications

The main policy implications of the study are that, the Ghanaian financial authorities should not focus only on using monetary policy to achieve price stability in the country. The Bank of Ghana must combine the monetary policy with fiscal policy for the desired impact. For example, fiscal discipline by way of avoiding excessive budget deficits will combine effectively with monetary policy to achieve a sound monetary policy regime, and unproved revenue mobilisation in the country. Thus monetary targeting policy of Ghana has to be combined with interest rate and inflation rate targeting policies for the desired impact.

5.3. Limitations of the Study

Due to absence of quarterly data on most of the variables, the researcher was limited to the available annual series and so could not use a multivariate model specification which might have yielded stronger parameter estimates. Nevertheless, the findings of the study are still very valid and useful.

6. Further Research Direction

It may be a useful research exercise to examine how the introduction of technological innovations into the banks affects demand for money in Ghana.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Financial Literacy, Financial Education: A Road Map to Personal Financial Well-Being and Prosperity

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Abstract

Large changes in the structure of financial markets, labor markets, and demographics in developed countries have offered consumers a bewildering array of complex financial products – from reverse mortgages to annuities – to choose from, making saving decisions increasingly complex. While financial literacy has always been important, the need for financial education has assumed greater urgency in many countries as such an ever wider range of financial products and financial services have been marketed to consumers. Financial literacy is very much about empowering individuals so that they can master this complexity and take full advantage of the benefits that flow from financial innovation and new financial products. Recognizing the importance of knowledge about financial decisions, a number of public agencies, private foundations, school systems, and employers have begun to sponsor financial literacy programs. Policymakers around the world have been wrestling with the idea of how to foster a population that is knowledgeable about and comfortable with basic financial planning. Building on these reviews and other market research findings, the article emphasizes the need for financial literacy and its impact on personal well-being, financial system and economy. The work has been extended to suggest *A Learner-Centered Approach to Financial Education* to increase the impact of financial literacy & its measurement and also ways to deliver financial education program to the society.

Keywords: Financial Education, Financial literacy, Financial Planning, Empowerment

1. Introduction

The evolution of market economies has dramatically broadened the opportunities of consumers, workers, investors, and firms. The sheer variety of goods and services that are easily accessible (for a price) would be breathtaking to people living just a century ago. At the same time, the multitude of choices can be bewildering. Increasingly, taking best advantage of available opportunities places heavy demands on the ability of actors to make sensible choices. The rising complexity affects nearly all market decisions, viewed in this light; the widening array of alternatives in the financial marketplace is part of the larger process operating in the economy as a whole. Nonetheless, financial decisions are particularly vexing to many of today's families and to many business people as well. Perhaps the confusion has arisen because of the speed at which financial markets and new financial instruments have emerged or because of the higher levels of sophistication and the longer time horizons required for sound financial decisions. Moreover, the added complexity is taking place just as house- holds face increased responsibilities for financial decisions and for insuring their own financial well-being. As

lengthening life spans are making retirement planning a higher priority, the shift from defined benefit to defined contribution pensions is increasing both the freedom and responsibility of workers to make choices. The expanding availability of credit options is providing individuals with more capacity to invest in education and owner occupied housing and to separate the timing of consumption from the timing of income. At the same time, bad decisions can mire households in debt and lead to much lower living standards than they could afford had their financial decisions been more sensible. For the new financial freedom to help most people, it is essential that they understand their choices and the likely implications of alternative choices.

1.1. Financial Education and Financial Literacy Programs

Recognizing the importance of knowledge about financial decisions, a number of public agencies, private foundations, school systems, and employers have begun to sponsor financial literacy programs. Policymakers around the world have been wrestling with the idea of how to foster a population that is knowledgeable about and comfortable with basic financial planning. Debt levels are on the rise worldwide while savings rates have dipped in many countries. As individuals face dwindling access to public pension funds and employer-sponsored retirement benefits, the responsibility for retirement savings — and all the adjunct risks associated with basic money management (e.g., investment risk) — are being increasingly thrust upon individuals who are not equipped to deal with these issues. Most schools do not teach basic financial planning concepts.

What is lacking is not information (who is charging what?), but rather the ability to interpret the information (how well do alternative mortgages strategies fit my needs?). Many people even seem unable to recognize the high future burden they will experience by borrowing at very high interest rates. Given the apparently weak financial knowledge of a large segment of the population, the high rates of consumer bankruptcy, and the large share of the population poorly prepared for retirement, there are reasons for concern.

Financial education programs are relatively new in developing and transition countries. While still few in number, innovative efforts are under way to help people improve management of their assets by building knowledge of key financial concepts and developing skills to make informed financial decisions. The aim is to improve knowledge and skills in budgeting, savings, debt management, use of bank services, and financial negotiations.

Financial behaviours often are reactive, responding to immediate problems and needs with little time to consider options, trade-offs, and longer-term consequences. The research studies further suggests that many are ill equipped to make informed, financial decisions especially in the context of rapid proliferation of new financial products and services from banks and other consumer entities. Managing formal sources of credit requires more discipline and forward planning. People usually learn about managing money informally through personal experience and from family, friends and peers rather than formal education. While poor people recognize the negative consequences of poor money management and the importance of financial literacy, they tend to see “financial education” as something for rich people.

Building on the above reviews and other market research findings, the article emphasizes the need for financial literacy and its impact on personal well-being, financial system and economy. The work has been extended to identify *A Learner-Centered Approach to Financial Education* to increase the impact of financial literacy & its measurement and also ways to deliver financial education program to the society.

The first part of the paper explains the need, importance of financial literacy and the desired financial behaviours. The second section discusses the framework of financial education programs and its impact followed by a special focus on enhancing the outcomes of a financial education program and the final section lays out the various ways of delivering the financial education programs.

2. Financial Literacy

Financial literacy is the ability to understand how money works in the world: how someone manages to earn or make it, how that person manages it, how he/she invests it (turn it into more) and how that person donates it to help others. More specifically, it refers to the set of skills and knowledge that allows an individual to make informed and effective decisions with all of their financial resources.

Several initiatives have been undertaken to improve financial literacy. The Organization for Economic Co-Operation and Development (OECD) comprehensively defines financial education as "the process by which financial consumers/investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being."

2.1. Why Financial Literacy Matters

Financial literacy matters at many levels. From a social welfare perspective, it obviously matters greatly whether or not people are able to manage their financial affairs wisely and live within their means. But the benefits of financial literacy extend well beyond stronger household balance sheets to the promotion of a more resilient financial system and, ultimately, to the more efficient allocation of resources within the real economy.

2.2. The Importance of Financial Literacy for Individuals and Families

For individuals and families, the *benefits* of financial literacy – which using shorthand is described as 'being good with money' – are well understood. The financially astute recognise the wisdom of sound financial planning from an early age and, by doing so; improve their chances of achieving their financial goals.

The *costs* of financial illiteracy – of 'being bad with money' – are equally apparent. Those who go through life making poor financial decisions will inevitably end up with a far lower standard of living than was otherwise achievable. Unfortunately, the opportunities for making poor financial decisions come thick and fast through life. Many of these – particularly for the young – are associated with easy access to credit and the 'buy now, pay later' marketing of many retailers. For some people, this fuels poor spending habits – indiscriminate and compulsive spending behaviour – which leads on, in turn, to spiralling debt problems. Sensible people can be parted from their hard-earned money. This usually occurs in one of two main ways. Some people fall prey to straight-out financial 'scams' / frauds – offers that 'seem too good to be true' or at times of low-inflation, low-interest rate environment – people are tempted to go off in search of investments offering far higher returns without fully understanding that these higher returns are likely to go hand-in-hand with much more risk.

2.3. The Importance of Financial Literacy to the Financial System

Financial literacy has a very important role to play in promoting stable household balance sheets – and small business balance sheets. The benefits can flow through from better financial education to the stability and efficiency of the financial system.

The existence of a stable financial system has much to do with the prudent management of risk by financial institutions, particularly credit risk – which is the risk of financial loss arising from the default of customers and counterparties. Of course, credit loss can never be eliminated completely, but good systems and controls can certainly help contain it. In a financially educated society, however, borrowers will be less likely to take on more debt just because credit is cheap and freely available. As a result, the people from such society will have a far better chance of riding out an economic downturn without defaulting on their debt repayments – which, in turn, will help minimise the bad debt experience of financial institutions and, by doing so, help bolster the stability of the financial system.

There is also a view that financial literacy can bolster financial stability by enhancing market discipline within the financial system. Certainly, if there is enough transparency in the financial system so that customers are both knowledgeable and well-informed, it does seem reasonable to predicate that they will direct their business away from riskier, poorly run financial institutions to those that are better managed.

2.4. The Importance of Financial Literacy to the Economy

What is good for individual households is often good for the economy as a whole. Economic development is very much about the successful channelling of domestic savings into productive investment opportunities. Similarly, promoting the sensible and prudent use of credit is both good for individual households and for the wider economy. Market economy will function much more effectively if the population is knowledgeable, forward-looking and financially literate. An efficient economy is one in which participants maximise their risk-adjusted returns so that resources flow to their most productive use relative to risk, leading to higher longer-term growth rates. When participants misjudge the risk-return trade-off, the consequences for the economy can be quite damaging.

While financial literacy has always been important, the need for financial education has assumed greater urgency in many countries as an ever wider range of financial products and financial services have been marketed to consumers.

Table 1 shows the key financial challenges and current financial behaviors based on which researchers at the organisation of "Freedom from Hunger" identified desired future behaviors and designing learning activities to improve knowledge, skills and attitudes in support of these behaviours. The focus of a financial education program should aim to achieve the desired behaviours listed in Table 1.

Table 1: Desired Financial Behaviours

Thematic Area	Examples of Current Behaviors	Examples of Desired Behaviors
Budgeting	• Live day-to-day • Reactive Financial Behaviors • Lack of forward financial planning	• Plan ahead for expenditures • Make a Budget • Use a budget to manage money
Savings	• Wasteful expenditures • Irregular savings • Savings not linked to goals	• Avoid unnecessary spending • Have a savings plan • Save regularly
Debt Management	• Borrow for emergencies • Over-indebtedness • Borrow with little understanding of terms and consequences of delinquency	• Maintain an emergency savings account • Make a plan to reduce debt • Avoid excessive debt • Borrow with full understanding of terms and conditions
Financial Negotiations	• Weak negotiating position in business relationships • Limited control by women over own earnings	• Negotiate for what you want in business transactions • Take an active role in decisions over own earnings
Bank Services	• Limited knowledge of bank services • Limited use of bank services	• Know about financial options and their terms and conditions • Use bank services to support financial goals

3. Financial Education and Awareness

Financial education and awareness initiatives can take many forms. Financial education includes instruction in personal finance concepts and the financial services landscape, and the development of the skills, attitudes and behaviours needed to make the right decisions for the individual. Elements of the landscape might include types of financial institution, products, how consumers are protected, and

getting advice. Skills would include, for example, understanding risk and reward, planning and budgeting, evaluating information, and comparing products. Attitudes and behaviours are particularly complex in the area of savings and investments, as individual risk preferences vary widely. It is important that education leads to a self-awareness of risk appetite and other drivers of saving behaviour. As well as increasing the capability to make sound financial decisions, financial education should also lead to more appropriate savings as people gain confidence and the skills to determine financial goals and the means of meeting them.

Information is the provision of facts or other data that will support or influence individual decision-making, by making consumers aware of choices and consequences. It may consist of quite general messages about savings and investment, or be targeted to specific audiences. A lot of information comes from the financial services industry, for example comparison tables and product disclosure. This needs to be distinguished from information provided by national authorities or educators. In itself, information will not necessarily improve decision making, as it is the ability to evaluate and use information which determines financially capable decision-making but it will ensure that consumers are more knowledgeable.

Advice or guidance supports individuals' financial decision-making by helping them evaluate the options that meet their particular circumstances and life stage. Advice can be tailored to individuals, and interactive, often face to face or on the telephone. Advice may increase financial well-being as it helps an individual through the process of evaluating information; the extent to which it improves financial literacy will depend on the outcome and the extent to which an individual learned anything during the process.

Different types of saving need different levels of awareness, knowledge and skills, as outlined in Table 2.

Table 2: Saving and Financial Education

Type of saving	Financial education and awareness requirements	
Precautionary	Estimating risk and costs of events like losing a job, or the house needing a new roof. Choosing between saving and insurance	Understanding the risks of informal saving, and the extent of depositor protection. Understanding interest rates and inflation. Learn how to recognise and, if necessary, overcome one's own behavioural biases and attitudes
Short-term	Setting short-term financial goals and planning. Choosing between credit and saving. Comparing different products	
Medium/long-term investment	Setting long-term goals. Understanding compounding, risk and return (including potential loss of capital), and the importance of diversification. Awareness of tax and other incentives. Understanding what different products do, and interpreting disclosure documents. Knowing where to get impartial advice. Awareness of rights and responsibilities, and availability of redress	
Non-financial assets	Understanding the risk and potential volatility of non-financial assets	
Decumulation	Understanding options for generating an income in retirement, and the costs and benefits of each. Comparing products.	

3.1. A Learner-Centered Approach to Financial Education

Figure 1: traces the relationship between financial education programs, financial literacy, and broader social and institutional impacts. Components of the framework are introduced and briefly described below. The suggested framework was developed to support Micro-finance clients. The elements in the framework are common for most types of financial programs, the same could be extended to include /support any other types of financial education as well.

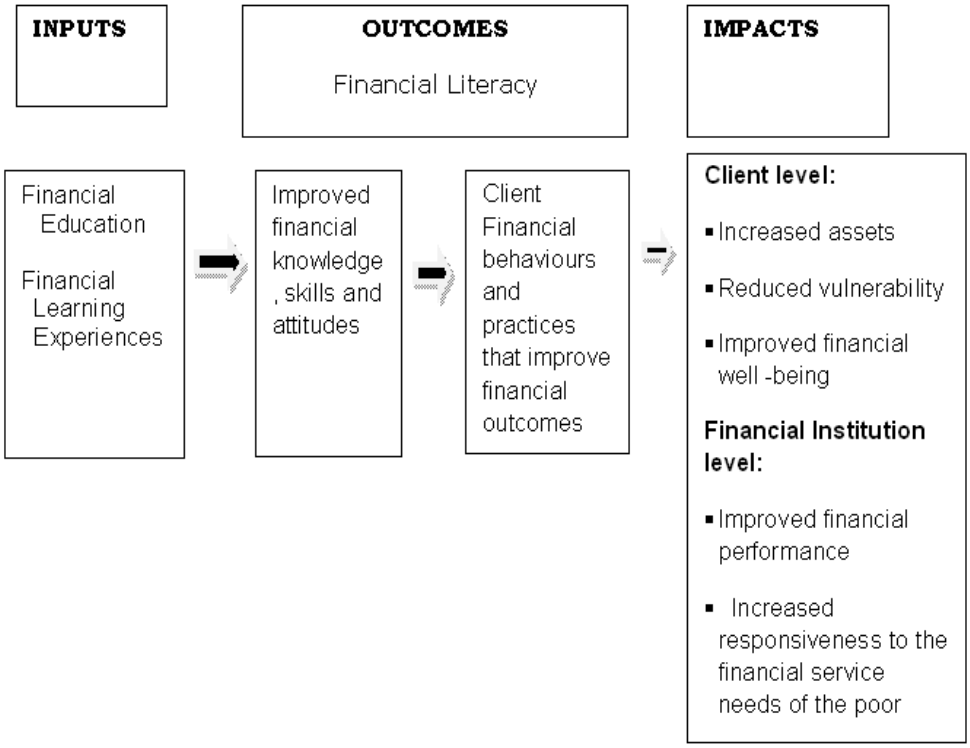
3.1.1. Inputs

The framework defines the input as *financial education*, including training programs, seminars, campaigns, and other types of learning events. This is the input variable in the framework. Several characteristics of financial education will condition the outcomes. The *design* of the financial education defines the behaviors it is seeking to achieve and drives the outcomes. Another is the *target group* for the financial education and whether the program is reaching the intended target group. Another factor is the *relevance of the content* of the financial education to the target group. The level of exposure of clients to financial education, or *how much* financial education is delivered is also important to consider.

A factor that is often overlooked is the *delivery system for financial education*. When, where, and how financial education is delivered to clients has important implications for its effectiveness in achieving outcomes and impacts. It is important to understand both the content of learning events and how the content is delivered. This might involve, for example, traditional classroom training, videos, brochures, interactive computer programs, or other means. Who delivers it also affects outcomes—community groups, social service agencies, training institutions, microfinance or other financial institutions, faith-based organizations, or special interest or affinity groups such as youth-serving organizations.

Financial learning experiences ("economic socialization") also play a key role in shaping financial knowledge, skills, attitudes and behaviors. This includes what people learn informally about money management from friends, parents, other family members, peers or teachers. The financial behavior of parents or other role models—for example, whether they save more than normal and communicate the basic elements of household saving to their children—can have a significant influence on the financial behavior of an individual (Bernhiem et al., 1997). People also learn through observation or exposure to positive role models or "positive deviants." In some cases, people learn through challenging personal experiences or "hard knocks."

Figure 1: Impacts of Financial Education



3.1.2. Outcomes

Financial literacy can be defined as knowledge of basic financial concepts and the skills and attitudes to translate this knowledge into behaviors that improve financial outcomes. *Knowledge* of financial concepts might include, for example, understanding the purpose of a budget or the elements of a savings plan. Other concepts include understanding loan terms and conditions or the difference between various types of financial institutions. *Skills* to translate this knowledge into behavior might involve how to make a spending plan, open a savings account, calculate an interest rate, or obtain information on the products and services offered by a particular financial institution. Examples of *attitudes* related to changed behavior might include motivation to work toward a financial goal, commitment to stick to a spending plan, discipline to save regularly, or confidence to walk into a bank and ask questions.

Improved financial knowledge, skills and attitudes should contribute to changes in financial *behavior*. One example of behavior change might be to move from reactive to proactive financial behavior by actually making a budget to plan ahead for expenditures or using a spending plan to manage money. Other examples of behavior change might be to cut back on wasteful expenditures (resist a spending temptation), open a savings account, or save more regularly. It also might involve negotiating the terms of a business purchase or sale, rather than accepting them as given.

Changes in financial behavior should, in turn, lead to improved financial outcomes. *Financial outcomes* may include, for instance, achievement of a specific financial goal such as reaching a savings target, establishing an emergency savings fund, decreasing debt, or purchasing a home or other asset. It might also involve reducing financial stress—the feeling of pressure due to relentless financial demands and worries. Another outcome could be greater financial satisfaction—a sense of financial control and financial well-being. This relates to financial stability—a perception or expectation that finances are the same or better than before (e.g., last year). Improved financial outcomes might also be indicated by a reduction in the amount of time spent on financial matters or the number of times that personal financial issues interfere with work or the accomplishment of other tasks.

3.1.3. Impacts

Ultimately, financial literacy can have higher-level social and institutional impacts. At the client level, over time, improved financial knowledge, skills, attitudes, behaviors and outcomes should contribute to increased assets. Because assets provide a store of wealth—financial, physical, human and social resources—to draw upon in times of need, they play a key role in reduced vulnerability and improved well-being for individuals and households.

In terms of institutional-level impacts, financial literacy among clients of financial institutions should contribute to improved financial performance (for example, portfolio growth, repayment rates, operational and financial sustainability) and profitability (return on assets and equity). Increased interaction of people with financial institutions can lead to the development of products and services more responsive to their needs and opportunities.

4. Focus on Enhancing and Measuring Outcomes of Financial Education Programs

This section focuses primarily on *financial literacy outcomes*; that is, changes in client knowledge of financial concepts, skills and attitudes to translate this knowledge into behaviors that contribute to good financial outcomes. The intent is to suggest ideas that can be adapted to individual programs and assessments, not a blueprint approach.

The next sections present illustrative indicators for assessing client-level changes in financial knowledge, skills, attitudes, behaviors and outcomes. The aim is to offer some ideas; however, it will be necessary for individual financial education programs to tailor the outcome indicators to their own programs and to the purpose of their assessments.

Two *key questions*: (1) does participation in financial education learning activities contribute to changes in financial knowledge, skills and attitudes; and (2) does financial education contribute to changes in financial behaviors and financial outcomes? These basic research questions can be further elaborated, based on the focus of each program or audience.

The *level of analysis* for assessing financial literacy outcomes is the individual level; that is, people who participate in financial education programs. Defining indicators and measures to assess the effectiveness of financial education programs poses a number of challenges. There is almost no experience in developing countries and no real consensus on which measures to use or benchmarks of success for these programs. This also is the case in the developed countries where programs are more mature (Lyons et al., 2003). In the context of new programs that are still developing and refining their objectives, learning activities, and delivery systems, there is also the caution not to have over-expectations regarding outcomes. There has been little or no experience with measuring the outcomes of financial education programs in developing countries. Microfinance Opportunities / Freedom from Hunger a non-profit organisation supporting the cause to eradicate poverty has made a first attempt to define outcome indicators for their programs. They will need to be tested, revised, and refined over time.

4.1. Indicators of Financial Literacy

Table 3, 4 & 5 presents the illustrative indicators of financial literacy in three groups: (1) financial knowledge, skills, attitudes; (2) financial behaviors; and (3) financial outcomes. They are derived from the five thematic areas of the Financial Education for the Poor Project: budgeting, savings accumulation, debt management, effective use of bank services, and financial negotiations. While these indicators are derived do not cover all possible financial literacy outcomes. Moreover, some of the same outcomes may be expected from more than one learning activity or different types of financial education.

Within each category, *knowledge* is what the person should know or the information they require to adopt the desired financial behavior. *Skills* are what the participant must have in order to adopt the behavior. *Attitudes* are thoughts, feelings, and opinions that support the behavior. *Financial behaviors* are the way a person acts or responds to a situation or event.

4.1.1. Knowledge, Skills and Attitudes

The relationship between the financial education delivered and changes in knowledge, skills and attitudes is set initially which in turn will help the program organisers to assess the effectiveness of the learning activities and suggest improvements that may be required. Table 3: includes illustrative indicators of financial knowledge, skills and attitudes related to the learning activities under our five themes.

Table 3: Illustrative Indicatiors of Financial Knowledge, Skills and Attitues by Financial Education Theme

Knowledge	Skills	Attitudes
BUDGETING		
• The purpose of a budget • The elements of a budget • The benefits of tracking cash flow • The benefits of a spending plan • Money beliefs • Financial goals	• Track cash flow • Construct a budget • Make a spending plan	• Commitment to work toward a financial goal • Commitment to follow a budget • Discipline to stick to a spending plan • Confident about managing money • Motivated to plan ahead
SAVINGS		
• The purpose of savings • Elements of a savings plan • Different ways to save	• Make a savings plan • Apply to open a savings account	• Belief in the benefits of savings • Discipline to save regularly

Table 3: Illustrative Indicatiors of Financial Knowledge, Skills and Attitues by Financial Education Theme - continued

• Different places to save • What to consider in shopping around for a savings account (accessibility, safety,costs)	• Use a savings passbook • Reconcile a savings account	
FINANCIAL NEGOTIATIONS		
• Principles of negotiations • Negotiation techniques • Steps to prepare for negotiations	• Set negotiation objectives • Make a plan to negotiate	• Confidence to negotiate • Commitment to stick to negotiating objectives
DEBT MANAGEMENT		
• Adv and Disadvantages of credit • Borrowings sources and options • Elements of loan • Commitments implied by taking a loan • Consequences of delinquency and default • Strategies for managing debt (pay higher debt priority; reduce lines of credit; make consistent and timely payments) for • Strategies for reducing debt (save for upcoming events; refinance to lower credit costs)	• Complete a loan application • Read and understand a loan agreement • Assess repayment capacity • Calculate the direct and indirect cost of taking • Calculate debt-to-income ratio • Make a loan repayment plan	• Confidence to ask questions • Confidence to negotiate terms • Caution in borrowing decisions • Strength to say “no” to unfavourable terms • Discipline to follow a debt-management plan
BANK SERVICES		
• Functions of a bank • Types of banks and financial institutions • Types of services provided by banks • Purposes of savings • Purposes of loans • Purposes of insurance • Financial services and its benefit	• Shop around for the best financial service to meet a need • Follow procedures for using bank products and services	• Confidence to ask questions • Confidence to deal with banks, bank staff, ATMs

4.1.2. Changes in Financial Behaviors

Changes in financial behaviors following exposure to financial educations is perhaps the most important outcome level, as it is the main objective of financial education and the primary means through which higher-level impacts will be achieved. Timing is an important consideration in assessing behavior change: some behavior changes can be observed immediately or soon after the training; others may take years to manifest themselves. For example, financial education clients may be able to state a realistic financial goal, or have a written budget if these were addressed in the program. Other behaviors will take longer to observe, such as establishing an emergency fund, using a new bank service or cutting back on wasteful expenditures. Some behaviors may be short-lived; for example, someone may implement a savings plan right after training, but give up on it after a few months. The focus here is to identify changes in financial behaviors and outcomes that may occur during the first year following exposure. One approach to assessing behavior change related to financial education is to identify indicators of positive financial behaviors (Table 4) and assess the number and proportion of people who report these behaviors before and after exposure to financial education.

Table 4: Illustrative Indicators of Financial Behaviors

Budgeting
• Has identified a realistic financial goal • Has made a written budget • Follows a spending plan • Has a plan for future expenditures
Savings
• Avoids unnecessary spending • Spends less than income • Has a realistic savings plan • Owns a savings account • Puts aside savings as soon as money comes in • Has an emergency fund • Saves regularly
Debt Management
• Borrows with full understanding of terms • Makes loan payments on time • Maintains an emergency savings account • Makes a plan to reduce debt • Avoids excessive debt • Maintains a debt-to-income ratio below a specified amount • Has experience with multiple financial products • Has experience with multiple financial institutions
Financial Negotiations
• Negotiates for what he/she wants business transactions • Takes an active role in decisions over own earnings

4.1.3. Financial Outcomes

Ultimately, improved financial knowledge, skills and attitudes, and changes in financial behaviors in our five thematic areas should contribute to financial well-being. This can be in areas directly related to the financial education modules, such as increased savings or improved debt management. It also may be reflected indirectly through more subjective measures of perceived financial stress or satisfaction. Financial well-being can be assessed through a combination of qualitative and quantitative data and objective and subjective measures. Table 5: presents the illustrative indicators of financial outcomes that must be assessed at the end of the program.

Table 5: Illustrative Indicators of Financial Outcomes

• Reduction in financial stress • Greater satisfaction with financial situation • Reduced amount of time spent managing financial matters • Reduction in number of times personal financial issues have interfered with work or other tasks • Financial stability • Perception that financial situation is the same or better than a year ago • Expectation that financial situation will be the same or better next year • Achievement of a financial goal • Motivation to plan ahead and set a financial goal • Independent financial decision • Reduced debt • Reduced debt-service ratio • Increased savings • Successful financial or business negotiation • Greater satisfaction with bank product or service

5. Delivering Financial Education and Awareness Initiatives

5.1. Schools

For many countries, the financial crisis and subsequent economic downturn gave added impetus to the drive to improve citizens' ability to manage their money, and the need to teach children about money. Personal finance education is now included in school curricula in over 20 OECD and non-OECD countries, and many more are planning to introduce it, often as part of a national financial literacy strategy. Financial education in schools is efficient as can reach almost all children and young people. It can also help overcome the disadvantages of financially illiterate parents. The OECD Programme for International Assessment (PISA) assesses the reading, mathematics and science ability of 15 year-olds. The PISA assessment framework includes savings-related concepts, for example, budgeting, planning ahead, benefits of medium and long-term savings and investments, building human capital, and smoothing spending through saving or borrowing. A number of countries have developed resources for classroom use, from booklets to online games and quizzes. Some are developed by the body responsible for financial literacy (e.g. finance ministry or regulator); others by financial services firms, or NGOs. To widen access to resources, there may be a central 'clearing house', like the Personal Finance Education Group (pfeg) in the UK, Jump$tart in the USA, or www.teachingfinancialliteracy.gov.au in Australia.

5.2. Websites

Providing information on the internet is an efficient way of reaching a large number of people, although the effectiveness of this medium relies on the individual being motivated enough to look at the website. A number of countries have developed websites which emphasise information and advice about savings and investments. These include Australia, Ireland, Mexico, New Zealand, Serbia, Singapore, South Africa and Turkey. Many of these use advertising and social media to encourage use of the sites.

5.3. Interactive Advice – Internet, Telephone and Face to Face

Interactive advice can be better tailored to the needs of individuals, and answer the questions they may have. Social media are increasingly used as an interactive tool as well as to transmit messages about savings and investments. Some countries encourage debate through social media and email (Mexico, New Zealand, Singapore), or provide a telephone service (Mexico, Palestine, UK). Mexico and the UK also have a face-to-face service. Specialised telephone advice about pensions is also available in some countries, including Mexico and the UK.

5.4. Seminars, Workshops and Adult Financial Education

As discussed above, financial education is often used to support initiatives based on asset building incentives. Aside from these specialised programmes, financial education serves a wide range of objectives, from encouraging saving to increasing knowledge and skills about aspects of money management, including budgeting and saving. Some examples include:

- In **Ireland** 'Money skills for life…' is a workplace programme providing financial education to employees.
- In **Japan**, the Central and Local Councils for Financial Services Information hold more than a thousand seminars for adults in a year, covering such topics as money management and securities investment. In addition, other governmental and private organisations in Japan give seminars and lectures on financial literacy for adult citizens.
- In **Romania**, the Private Pension System Supervisory Commission launched a campaign in 2010: "Learn to choose! Private pension, a young decision". This includes financial education events in universities, a web banner campaign, and TV and radio coverage.

- In **Singapore**, the MoneySENSE programme covers money management, financial planning and investment know-how. The programme includes regular investor education seminars, providing information on the features and risks of savings and investment products.

6. Conclusions

In modern economies, people must make frequent decisions embodying important financial concepts. While the reliance on individuals to make their own financial decisions is increasing in most modern economies, the worry is that too many individuals are ill-prepared. It is not surprising that many governments are trying to increase the financial knowledge of their citizens. The question is, what approaches can best promote financial knowledge and sound financial decisions? A sensible education approach suggested in the paper enables the sponsor to delineate the skills necessary for every adult to master, and provides a framework for adults to engage in continuous learning to attain financial expertise. Education concerning credit and debt issues can be critical for helping people avoid excess indebtedness, mortgage delinquencies and foreclosures, bankruptcies and borrowing that is excessively costly. Financial literacy programs have the potential to achieve significant and cost-effective improvements in economic welfare.

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

An Empirical Analysis of the Impact of Mobile Broadband on Economic Growth in Emerging Economies

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Abstract

Mobile broadband penetration in developing countries is expected to reach 8.5 percent by the end of 2011, up from 5.3 percent recorded in 2010 (ITU 2012). It is also expected that emerging regions will surpass the developed world in terms of the number of mobile broadband connections in first half of 2013. Thus the impact of mobile broadband on economic growth in these countries is a vital issue that needs to be vigorously investigated. The contribution of the present paper is in the estimation of this impact with a focus on emerging economies from 2008-2011. Results reveal the positive and highly significant impact of mobile broadband on economic growth in emerging countries. Our analysis shows that in emerging countries, 1 percent increase in mobile broadband per household would lead to approximately 7 percent increase in GDP growth rate, ceteris paribus. Adding additional controls, such as the Global Competitiveness Index and the Independent Regulator, the conclusion reveals that these controls are statistically insignificant.

Keywords: Mobile broadband, growth, emerging countries, panel data, endogeneity, instrumental variables. JEL-classification: L96

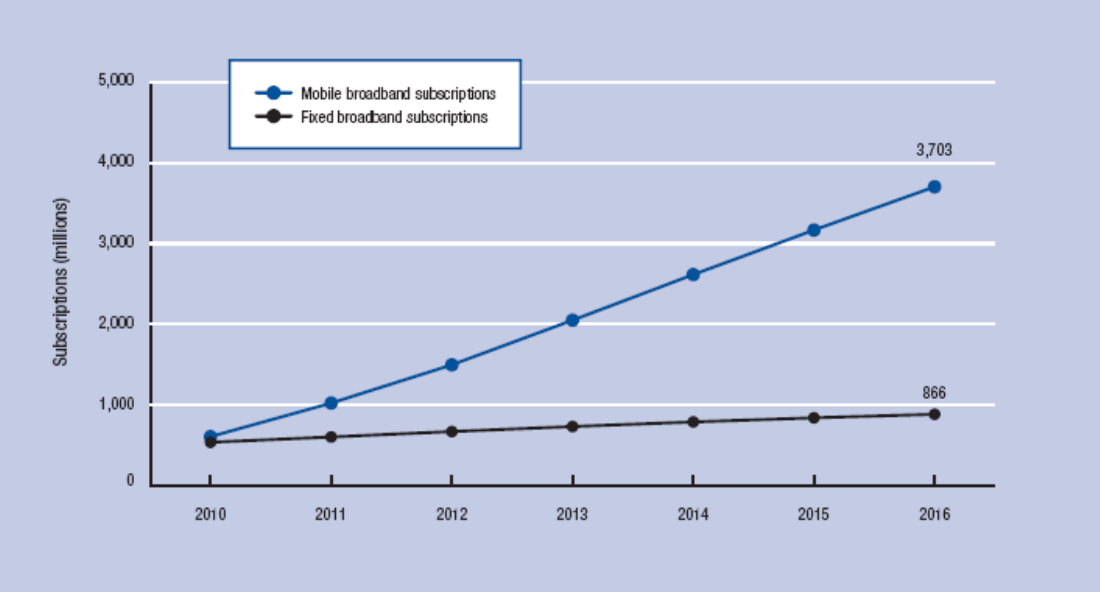
1. Introduction

Mobile broadband is about ubiquitous connectivity to the Internet. Mobile Broadband can create a win -win situation, when it comes to increasing productivity, creating jobs, overcoming the digital divide and at the same time mitigating climate change.

Mobile broadband has actually become the primary method to access the internet globally. According to the Global Information Technology Report 2012, by the end of 2010, the number of broadband internet subscriptions over mobile technologies surpassed the number of number of fixed broadband subscriptions.

In fact it has been estimated that mobile broadband will reach 1.19 billion subscriptions in more than 160 countries by the end of 2011. In developing countries, mobile broadband penetration reached an estimated 8.5 percent by the end of 2011, up from 5.3 percent recorded in 2010 (ITU 2012).

Figure 1: Mobile Broadband subscriptions will reach 80 percent by 2016



Sources: Industry analyst firm forecasts. For mobile broadband subscriptions: HSPA, EV-DO, TD-SCDMA, and LTE subscribers: Wireless Intelligence Database, February 2012; for WIMax: ABI Database, February 2012: for fixed broadband subscriptions: Informa Telecoms & Media (WBIS) Database, February 2012.
Source: Global Information Technology Report (WEF 2012)
Note: Mobile broadband technologies include EV-DO, HSPA, TD-SCDMA, LTE, **WIMAX** and their respective evolutions.

Mobile broadband penetration is particularly accelerating in emerging economies , rising from 61 percent of all broadband connections in these regions in 2011 to 84 percent in 2016 (Table1). Therefore, it is expected that emerging regions will surpass the developed world in terms of the number of mobile broadband connections in first half of 2013.

Table 1: Emerging countries are accelerating in mobile broadband connections

	2011 Connections (millions)	2016 Connections (millions)
Mobile broadband in emerging regions	415	2,366
Total broadband in emerging regions	676	2,826
Mobile broadband (as a % of total)	61%	84%

Sources: Mobile broadband: Wireless Intelligence Database, February 2012; fixed broadband: Informa Telecoms & Media (WBIS) Database, February 2012.

Source: Moblie broadband: Wireless Intelligence Database, February 2012 fixed broadband: Informa Telecoms & Media (WBIS) Database, February 2012.
Source: Global Information Technology Report (WEF 2012)

At the same time, and based on findings of the Virtual Networking Index study of Cisco Systems, published in 2012 (VNI 2012), it was clearly identified that traffic from wireless devices will exceed traffic from wired devices by 2016. In 2016, wired devices will account for 39 percent of IP traffic, while Wi-Fi and mobile devices will account for 61 percent of IP traffic. In 2011, wired devices accounted for the majority of IP traffic at 55 percent.

Globally, mobile data traffic will increase 18-fold between 2011 and 2016. Mobile data traffic will grow at a cumulative annual growth rate CAGR of 78 percent between 2011 and 2016, reaching 10.8 exabytes per month by 2016. One exabyte is 10^18 bytes.

Global mobile data traffic will grow three times faster than fixed IP traffic from 2011 to 2016. Global mobile data traffic was 2 percent of total IP traffic in 2011, and will be 10 percent of total IP traffic in 2016, as shown in Table 2 .

Table 2: Consumer Internet Traffic, 2011-2016

Consumer Internet Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed	20,121	29,095	35,943	45,372	57,991	74,247	30%
Mobile	402	879	1,717	3,116	5,213	8,313	83%
By Subsegment (PB per Month)							
File sharing	6,013	7,403	9,153	11,569	14,758	18,892	26%
Internet video	10,423	16,880	20,904	26,722	34,755	45,280	34%
Web, email, and data	3,863	5,422	7,274	9,783	13,119	17,583	35%
Online gaming	77	115	170	251	404	630	52%
Voice over IP (VoIP)	147	154	159	163	169	174	3%
By Geography (PB per Month)							
North America	5,394	8,041	9,022	10,294	12,499	15,646	24%
Western Europe	5,132	7,463	9,311	11,822	14,796	18,233	29%
Asia Pacific	8,220	11,795	15,266	20,204	26,515	34,553	33%
Latin America	780	1,196	1,833	2,835	4,352	6,506	53%
Central and Eastern Europe	817	1,211	1,686	2,398	3,392	4,699	42%
Middle East and Africa	180	328	542	935	1,649	2,783	73%
Total (PB per Month)							
Consumer Internet traffic	20,523	29,974	37,660	48,488	63,204	82,560	32%

Source: Cisco VNI, 2012

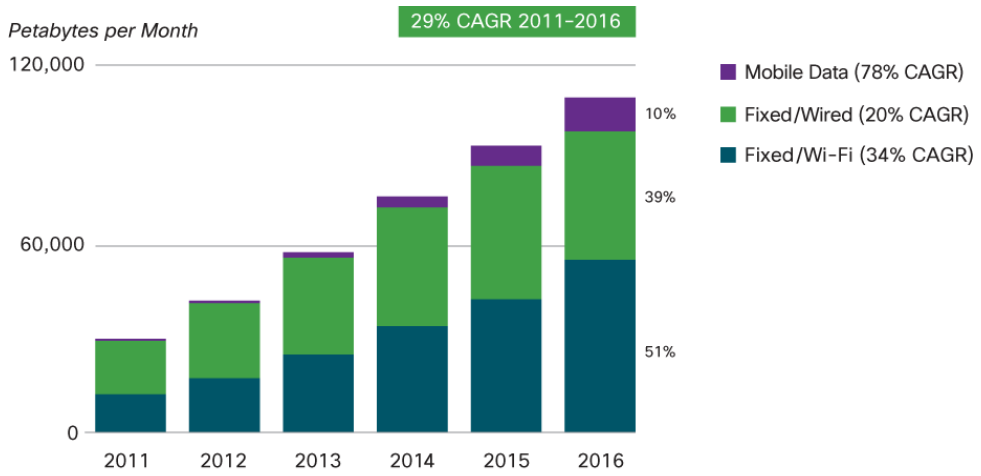
Mobile data traffic includes handset-based data traffic, such as text messaging, multimedia messaging, and handset video services (Table 2). Mobile Internet traffic is generated by wireless cards for portable computers and handset-based mobile Internet usage. On a geaograpical basis, the Middle East and Africa region will see a significantly faster growth in mobile data traffic at a CAGR of 104% compared to CAGR 75% fro North America and 68% for Western Europe. This is shown in Table 3.

Table 3: Mobile data and Internet Traffic, 2011-2016.

Mobile Data and Internet Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Geography (PB per Month)							
North America	119	259	493	844	1,305	1,964	75%
Western Europe	180	366	684	1,161	1,705	2,438	68%
Asia Pacific	206	438	832	1,503	2,614	4,323	84%
Latin America	40	77	146	267	455	738	79%
Central and Eastern Europe	34	68	134	253	439	706	83%
Middle East and Africa	18	45	91	187	378	635	104%
Total (PB per Month)							
Mobile data and Internet	597	1,252	2,379	4,215	6,896	10,804	78%

Source: Cisco VNI, 2012

Figure 2: Global IP Traffic, Wired and Wireless



Source: Cisco VNI Global Forecast, 2011-2016

The rapid growth of mobile data traffic has been widely recognized and reported. The trend towards mobility carries over into the realm of fixed networks as well, in that an increasing portion of traffic will originate from portable or mobile devices. Figure 2 shows the growth of wireless and mobile traffic in relation to traffic from wired devices. The increasing use of portable devices, even those not currently providing mobile access, creates even greater potential for traffic migration from fixed to mobile devices. Portable devices also increase overall traffic by increasing the contact time with the network.

Reasons for this increased uptake in mobile broadband penetration include the decline in handsets' prices especially smartphones, such that smartphones are now more affordable to bottom of the pyramid population in developing and emerging countries. The wide spread use of smartphones in developing countries is expected to grow even more reaching 63 percent in 2015 (ITU 2012). Economies of scale and increased competition in mobile phone markets lead to the decrease in the price of the smartphones. Another reason for the increased uptake of mobile broadband include the emergence of new wireless technology which is the 4G or LTE which entails higher speed and better quality of mobile broadband for the end user. In addition, adopting the prepaid business model for mobile broadband service lead the wide spread and more affordable use of this service to the general public.

Another important relevant issue to mobile broadband is Digital Dividend. (DD) plays a major role in increasing the benefits of mobile broadband. From the mobile operator's perspective DD constitutes a good chance to introduce new services such as mobile broadband and expand their existing ones, such as voice services, to include new areas not covered before. Harmonization in band plans is key in order to ensure to reap the benefits of scale economies in the manufacture of mobile network infrastructure and devices. This would also reduce the cost to the end user (GSMA 2011a,b).

From the operators' perspective, digital dividend (DD) plays a major role in increasing the benefits of mobile broadband. DD refers to the options arising from the release of spectrum afforded by the digital switch- over program, where in general the ITU mandates that the switch over to digital TV takes place globally by 2015. It is noteworthy in this respect to point out that the main concern is about the external dividend , which is the released spectrum not used in broadcasting services, but is intended to be used in mobile broadband services.

The 800 MHZ bands are highly attractive as they provide high quality band for wide mobile coverage. This band is actually better than the UMTS, 3G band in terms of coverage.

The rest of the paper is divided as follows; section 2 presents an overview of the literature, section 3 highlights the empirical study with emphasis on solving the endogeneity problem, then the analysis of the results in section 4, and finally section 5 concludes with policy recommendations.

2. Literature Review

The economics of mobile broadband is an interdisciplinary topic. Specifically from the economic and social science perspective, economics of mobile broadband is multifaceted. First, mobile broadband can be analyzed by investigating its impact on economic growth as this paper is mainly concerned with this aspect. Another approach would be to study the factors that impact mobile broadband uptake in a country or a set of countries. Finally, research can also tackle the important question of whether mobile and fixed broadband are substitutes or complements.

One of the most important insights about mobile broadband and economic growth came from the analysis provided by Thompson et al (2011). In his paper about economic impacts of mobile versus fixed broadband, he came to the conclusion that in a sample that includes high income; low income countries mobile broadband has a positive and critical direct impact on GDP, while fixed broadband has none. More importantly, low income countries benefit more from broadband compared to high income countries. He focused on estimating both the direct and the indirect impact of both fixed and mobile broadband. In his empirical model he solve the problem of endogeneighty by using appropriate instrumental variables using 2 separate equations for the mobile broadband and the fixed broadband. find that the direct impact of mobile broadband on economic growth in developing and developed countries are positive and significant. In particular some studies succeeded in quantifying this effect such as a study by Analysis Mason estimate that 10 percent increase in mobile broadband penetration will generate 1.1 percent of the entire India's GDP. In South Africa mobile broadband was estimated to generate about 1.8 percent of GDP by 2015.(Analysis Mason 2010)

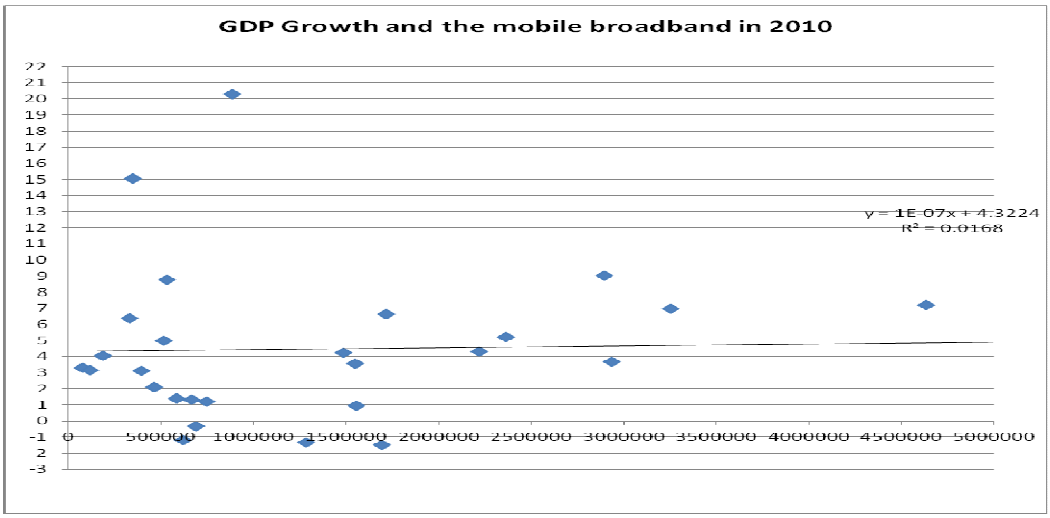
As to the other approach of analyzing mobile broadband through the factors that determine its uptake, another study by Lee et al in 2011, investigated these determinants in the OECD countries and concluded that multiple standardization policy and population density are the main factors of mobile uptake in OECD countries. In their study they implement a logistic diffusion model to analyze the factors that influence the diffusion of both fixed and mobile broadband. They highlight their findings of factors such as multiple standardization policy and population density to be the main factors of the initial diffusion of mobile broadband.

Another way to investigate the mobile broadband from an economic approach is relationship between mobile and fixed broadband and whether they are substitute or complement. According to Srinuan et al 2012, survey data from 2009 reveal that mobile broadband is indeed substitute to fixed broadband across most of Sweden. On the other hand, Lee et all (2011) concluded in their study that mobile broadband service is a complement to fixed broadband in the initial deployment of broadband in OECD countries.

3. The Empirical Study

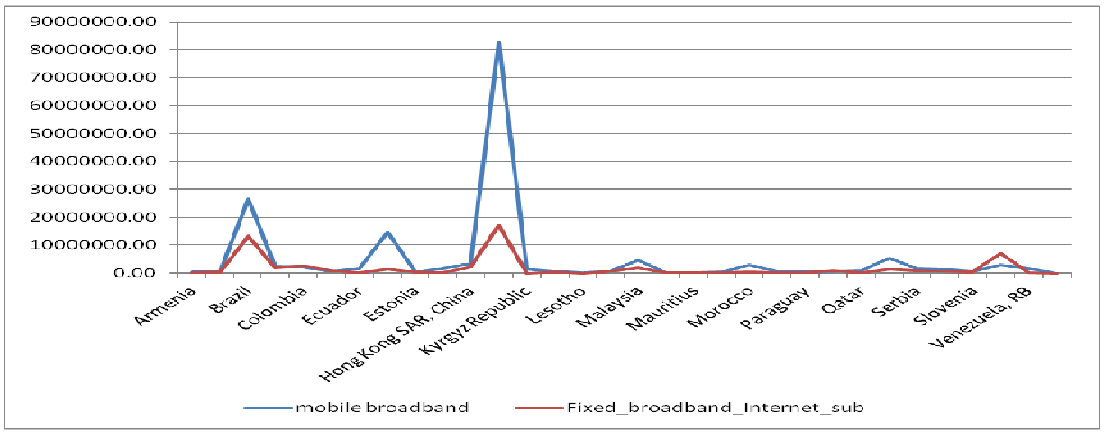
The sample of emerging countries consists of thirty one emerging and developing countries for the years 2007-2010. Data were obtained from the ITU indicators data base as well as the World Bank indicators database. The Global Competitiveness index was obtained from the World Economic Forum. In addition, the Global Competitiveness index is controlled for in the growth equation. Global Competitiveness Index takes into account microeconomic and macroeconomic aspects of the respective economies. It encompasses 12 different pillars such as: institutions, infrastructure, macro economy, business sophistication and innovation. The global competitiveness index takes into account the variation in the development level of each country in their rank of countries. The GCI takes the stages of development into account by attributing higher relative weights to those pillars that are more relevant for an economy given its particular stage of development (WEF 2012). The status of the telecom regulator in the respective countries is also controlled for. The dummy variable of telecom regulator takes the value zero if the telecom regulator is not independent and one if it is independent.

Figure 3: Economic growth and mobile broadband in 2010:



Source: prepared by the Author. Data obtained from ITU and WDI databases

Figure 4: Mobile Broadband subscriptions compared to fixed broadband subscriptions in 2010 in some emerging countries:



Source: prepared by the author. Data obtained from the ITU database

The explanatory variable of interest is the mobile broadband. Definition of mobile broadband includes two components or indicators, namely the standard mobile subscriptions with use of data communications at broadband speeds (i.e. mobile-cellular subscriptions with advertised data speeds of 256 kbit/s or greater and which have been used to set up an Internet data connection) and dedicated mobile data subscriptions at broadband speeds (i.e. subscriptions to dedicated data services over a mobile network which are purchased separately from voice services, either as a standalone service – e.g. using a data card such as a USB modem/dongle – or as an add-on data package to voice services requiring an additional subscription. (ITU, 2011). The variables used in the analysis are per household following Wallsten (2009, 2010). Rational for to dividing the variables used in the model by number of households is the following: if mobile phone exists in the household, then all members of the family could theoretically use it, and thereby extending access to its service. Household availability has thus been the traditional way to measure universal service. Notice that access is higher in countries with larger households. Therefore some of the low income nations have higher mobile phone home penetration than developed economies such as Senegal compared to Canada. (Global Information Technology Report 2012).

Endogeneity exists between economic growth or GDP growth rates and the mobile broadband as there is a two way relationship between both the dependent and the explanatory variable of interest.

Endogeneity problem has been solved by applying the two stage least square and using cellular subscription rates and fixed line subscription rates as instrumental variables in our model (Czernich et al 2011).

The empirical model relies on a log–linear approximation around the steady state of an augmented growth model (Barro 1992, Barro et al 1996, Mankiw et al 1995) where we control for additional variables to determine further factors that impact growth in the 31 countries included in the sample for the time period 2007-2010, including the mobile broadband penetration rate independent variable (Badran et al 2011), the presence of independent telecom regulator and global competitiveness index. Countries analysed in the sample include Arab Countries such as Egypt, Morocco, Oman and Saudi Arabia. Other developing / emerging countries in the sample are Turkey Malaysia, Ghana and Brazil.

The growth equation to be estimated is as follows:

$$\log \Delta \text{ yithh} = \alpha_0 + \alpha_1 \text{ MBB HH}_{it} + \alpha_2 \text{ GCF P GDP HH}_{it} + \alpha_3 \text{ POPD}_{it} + \alpha_4 \text{ INDREG}_{it} + \alpha_5 \text{ EDHH}_{it} + \alpha_6 Y_{t-1\,it} + \alpha_7 \text{ GCI}_{it} + \varepsilon_{it}$$

Where i index is for the countries, t index stands for time.

where $\varepsilon_{i,t} \sim (N, \sigma)$ iid (identically independent, distributed errors)

Table 4: Description of the variables

Variable	Description	Source
GDPHH	Gross Domestic Product (PPP) per household, Constant 2000 dollars	World Bank, WDI
Y_{t-1}	Level of GPDPHH in previous year	World Bank , WDI
GFCF_Pct_GDP_HH	Gross fixed capital formation (% of GDP) per household	World Bank, WDI
Population_density	Population density (people per sq. km of land area)	ITU
INDREG	Regulator	ITU
EDHH	Total Tertiary School Enrollment per household	World Bank, WDI
GCI	The Global Competitiveness Index	World Economic Forum
Mobile_cellular_telephone_sub_HH	Mobile-cellular telephone subscriptions per household	ITU
Fixed_telephone_sub_HH	Fixed-telephone subscriptions per household	ITU

Estimation method is panel data techniques, where we apply 2SLS on the panel data solving the problem of endogeneity of mobile broadband and economic growth and the omitted variable bias. Although the panel data solves the problem of omitted variable bias, however, there is still the problem of endogeneity. Fixed and mobile phones per households are used as instruments. These instruments are correlated with the engodenous variable, namely mobile broadband, but not correlated with the error term as was established by Czernich et al 2011 and Thompson et al (2011) in their models. After omitting the outliers, we run the regressions on panel data first to choose between the pooled, applying simple OLS, and the panel data (RE), and fixed effects (FE). Then, we run the LM test after we obtain the results for the pooled, the fixed and the random effects models. The LM test reveals that the null hypothesis can be reject and thus the random effects model is the chosen model(Tables 1,2,3,4 in Appendix)). So the OLS estimates of the pooled regression are biased even if additional controls are added to the specification (Baum et el 2007).Then using the Hausman test we choose between the fixed effects and the random effects models, and using the Hausman test the null can be rejected where the chosen model is the fixed effect model (Table 5).

The next step in our analysis is to choose between the pooled, fixed effects and random effects with Instrumental variables added, in order to solve the problem of endogeneity, explained earlier. Instruments used in the analysis are the fixed and mobile telephone lines which are not correlated with

the error term but correlated with the endogenous variable the mobile broadband. The Hausman test to choose between the fixed effects IV and random effects IV , conclude that the null hypothesis can be rejected of the random effect model and we choose the fixed effect model with IV (Tables 6,7,8, 9). To check if there is endogeneity present in model, we perform the Hausman test again but this time between the fixed effects IV and fixed effects with no IV, and in this case we can reject the null of FE and accept the FE IV model (Tables 10). Thus we can conclude that we detected and solved the problem of endogeneity and we choose the model (Table 7) to show the causal relationship between the mobile broadband penetration rate.

To fulfill the convergence theory, the y_{t-1} was added to the model. Nevertheless, the very high correlation between this explanatory variable and the dependent variable, lead to its drop from the fixed effects IV model. Other control variable included in model was the Global Competitiveness Index. However, this explantory variable came out insignificant due to the very low correlation coefficients and that is mostly statistically insignificant.

4. Analysis of the Results

The empirical analysis reveals that there is positive and significant impact of mobile broadband on economic growth in emerging countries, where a one percent increase in mobile broadband would lead to approximately 7 percent increase in GDP growth rate, ceteris paribus (Table 7). The analysis also reveal the existence of the endogeneity between economic growth and mobile broadband, which was resolved by using the instrumental variables in the two stage least square regressions. The impact of mobile broadband on economic growth is higher than the previous results reported by other research studies, due to the countries included in the sample. The current study focuses on developing and emerging countries, which justifies the larger impact of mobile broadband penetration of economic growth in these countries. The global competitiveness index estimates show the positive but insignificant impact of global competitiveness on economic growth in these set of emerging countries. Independent regulator was omitted due to the insignificance and very low correlation between the independent regulator and the both the mobile broadband variable and the dependent variable of economic growth. This despite of the existing literature that shows how it is instrumental and critical for the telecom regulator to be independent and autonomous in order to achieve efficiency in the telecom sector (Wallsten 1999) .

Table 7: Two stage Least Square estimation results

Fixed-effects (within) IV regression **Number of obs = 109**
Group variable: countryname1 **Number of groups = 28**
R-sq: within = 0.2966 **Obs per group: min = 1**
between = 0.0112 **avg = 3.9**
overall = 0.0022 **max = 4**
Wald chi2(3) = 5.18e+06
corr(u_i, Xb) = -0.8706 **Prob > chi2 = 0.0000**

lnGDPHH	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
mobile_BB_HH	0.0771384	.0291544	2.65	0.008	0.0199968	0.1342799
yo	(omitted)					
GFCF_Pct_G~H	8455.623	1573.097	5.38	0.000	5372.41	11538.84
Population~y	0.0108421	.0045948	2.36	0.018	0.0018364	0.0198477
INDREG	(omitted)					
_cons	9.324006	.3666562	25.43	0.000	8.605373	10.04264
sigma_u	1.6691248					
sigma_e	0.0476577					
rho	0.99918542	(fraction of variance due to u_i)				

F test that all u_i=0: F(27,78) = 6.54 Prob > F = 0.0000
Instrumented: mobile_BB_HH
Instruments: yo GFCF_Pct_GDP_HH Population_density INDREG Mobile_cellular_telephone_sub_

5. Conclusion

An important conclusion of the empirical analysis conducted in this paper, is that 1percent increase in mobile broadband would lead to 7 percent increase in GDP. This estimated impact of mobile broadband is inline with previous findings from several studies such as Analysis Mason in 2010. Another important finding of the empirical study is the statistically insignificant impact of both an independent telecom regulator and the global competitiveness of the respective country on its economic growth. While the former is theoretically and practically vital for the operations of a healthy and functional telecom sector, however when it comes to the mobile broadband in the sample of the chosen emerging countries, the independent regulator did not play an important role for the economic growth of these countries over the period under investigation. As to the latter, namely the global competitiveness index, the correlation with the economic growth in these set of countries was very low and statistically insignificant. These findings do not undermine the major role that was shown from the empirical analysis explained about the role of mobile broadband especially in emerging economies in increasing economic growth. Mobile broadband can be and should be used as engine for growth. It should be integrated in all aspects of life such as health, education, banking, etc. Although in emerging countries it is starting from a low base, but the progress in its uptake and the potential for further increase in its uptake is quite high (Boston Consulting Group 2012).

Investment in national network infrastructure, particularly fiber deployment, is necessary to allow greater mobile broadband data penetration. In this case, fiber deployment for mobile traffic backhaul will resolve current network bottlenecks that currently impede operators from deployment of mobile broadband technologies with higher capacity such as LTE.

This would result, however, in the need to increase the network capacity especially as network traffic is expected to increase dramatically. Such traffic escalations will most likely be even more evident for emerging market operators for three reasons. According to McKinsey recent report on "Transition to digital in high-growth markets 2011" the first reason includes tendency for emerging markets to start with far lower data traffic per user, and then they are likely to followed by high prices. Second reason, the low penetration rates of fixed Internet access in emerging markets, so more people depend on mobile broadband as their exclusive way to access the Internet. And finally, subscribers in emerging markets cannot afford to pay high prices, so low price elasticity helps customers to exploit flat rates and prepaid pricing, thus pushing the boundaries of their fair use policies. .Policy makers in emerging and developing countries should encourage and adopt the refarming of existing 2-G spectrum bands, which can ultimately help operators migrate faster to the LTE and thus allow more spectrum for operators and better mobile broadband services for emerging countries population.

Acknowledgment

The authors are very grateful for the useful comments of Dr. Henry I. Penikas of the Higher School of Economics, National Research University, Moscow.

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Appendix

Table 1:

Linear regression				Number of obs	=	109
				F(5, 103)	=	3852.86
				Prob > F	=	0
				R-squared	=	0.9923
				Root MSE	=	0.06882
lnGDPHH	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
yo	0.9960219	0.0078682	126.59	0	0.9804171	1.011627
GFCF_Pct_G~H	1457.791	491.0099	2.97	0.004	483.9883	2431.593
EDHH	-1129.689	356.5931	-3.17	0.002	-1836.907	-422.4704
_Iyear_2008	0.0299799	0.0147023	2.04	0.044	0.0008214	0.0591385
mobile_BB_HH	0.0446514	0.0258425	1.73	0.087	-0.0066011	0.0959039
_cons	0.0506275	0.0815899	0.62	0.536	-0.1111868	0.2124419

Table 2:

Fixed-effects (within) regression — Number of obs = 109
Group variable: countryname1 — Number of groups = 28
R-sq: within = 0.4247 — Obs per group: min = 1
between = 0.0129 — avg = 3.9
overall = 0.0028 — max = 4

F(4,77) = 14.21
corr(u_i, Xb) = -0.9330 — Prob > F = 0.0000

lnGDPHH	Coef.	Std. Err.	t	P>t		[95% Conf.	Interval]
yo	(omitted)						
GFCF_Pct_G~H	6493.144	1350.123	4.81	0.000		3804.707	9181.582
Population~y	0.0163139	.003852	4.24	0.000		.0086436	.0239842
_lyear_2008	0.0251611	.0102696	2.45	0.017		.0047118	.0456104
mobile_BB_HH	0.0280185	.0184453	1.52	0.133		-.0087108	.0647479
_cons	8.917435	.3116171	28.62	0.000		8.296926	9.537944
sigma_u	2.3435415						
sigma_e	0.04337923						
rho	0.99965749	(fraction of variance due			to	u_i)	
F test that all	u_i=0:	F(27, 77) =	7.79			Prob > F =	0.0000

Table 3:

Random-effects GLS regression — Number of obs = 109
Group variable: countryname1 — Number of groups = 28
R-sq: within = 0.2418 — Obs per group: min = 1
between = 0.9953 — avg = 3.9
overall = 0.9922 — max = 4

Wald chi2(6) = 4619.85
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

lnGDPHH	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
yo	1.006192	0.0158411	63.52	0	0.975144	1.03724
GFCF_Pct_G~H	2520.292	765.0434	3.29	0.001	1020.834	4019.75
EDHH	-1485.191	475.6788	-3.12	0.002	-2417.504	-552.8779
_lyear_2008	0.0327921	0.0116403	2.82	0.005	0.0099776	0.0556066
_lyear_2010	0.0441524	0.0165303	2.67	0.008	0.0117537	0.0765512
mobile_BB_HH	-0.0060931	0.0261899	-0.23	0.816	-0.0574244	0.0452382
_cons	-0.0646845	0.1645797	-0.39	0.694	-0.3872548	0.2578858
sigma_u	0.04933586					
sigma_e	0.04535734					
rho	0.54194078	(fraction of variance due to u_i)				

Table 4:

```
Estimated results:
                    |       Var     sd = sqrt(Var)
          ----------+------------------------------
           lnGDPHH  |    .5863111        .7657096
                 e  |    .0020573        .0453573
                 u  |     .002434        .0493359

Test:   Var(u) = 0
                          chibar2(01) =     30.30
                       Prob > chibar2 =    0.0000
```

Table 5:

Table (5)	Hausman Test			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe1	re1	Difference	S.E.
GFCF_Pct_G~H	6493.144	2520.292	3972.852	1112.448
_Iyear_2008	0.0251611	0.0327921	-0.007631	.
mobile_BB_HH	0.0280185	-0.0060931	0.0341116	.
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)			= 12.75	
Prob>chi2 = 0.0004				
(V_b-V_B is not positive definite)				

Table 6:

Instrumental variables (2SLS) regression						
Source	SS	df	MS	Number of obs	=	109
				F(3, 105)	=	3275.07
Model	62.6503329	3	20.8834443	Prob > F	=	0
Residual	0.67127	105	0.006393048	R-squared	=	0.9894
				Adj R-squared	=	0.9891
Total	63.3216029	108	0.586311138	Root MSE	=	0.07996
lnGDPHH	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
mobile_BB_HH	0.146029	0.0541439	2.7	0.008	0.0386716	0.2533864
yo	0.9789841	0.0106859	91.61	0	0.957796	1.000172
EDHH	-543.4393	224.0687	-2.43	0.017	-987.7261	-99.1524
_cons	0.2225376	0.107274	2.07	0.04	0.0098332	0.435242
Instrumented: mobile_BB_HH						
Instruments: yo EDHH Mobile_cellular_telephone_sub_HH						

Table 7:

Fixed-effects (within) IV regression	**Number of obs = 109**				
Group variable: countryname1	**Number of groups = 28**				
R-sq: within = 0.2966	**Obs per group: min = 1**				
between = 0.0112	**avg = 3.9**				
overall = 0.0022	**max = 4**				
	Wald chi2(3) = 5.18e+06				
corr(u_i, Xb) = -0.8706	**Prob > chi2 = 0.0000**				
lnGDPHH	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
mobile_BB_HH	0.0771384	.0291544	2.65	0.008	0.0199968	0.1342799
yo	(omitted)					
GFCF_Pct_G~H	8455.623	1573.097	5.38	0.000	5372.41	11538.84
Population~y	0.0108421	.0045948	2.36	0.018	0.0018364	0.0198477
INDREG	(omitted)					
_cons	9.324006	.3666562	25.43	0.000	8.605373	10.04264
sigma_u	1.6691248					
sigma_e	0.0476577					
rho	0.99918542	(fraction of variance due to u_i)				
F test that all u_i=0: F(27,78) = 6.54			Prob > F = 0.0000			
Instrumented: mobile_BB_HH						
Instruments: yo GFCF_Pct_GDP_HH Population_density INDREG Mobile_cellular_telephone_sub_						

Table 8:

G2SLS random-effects IV regression — Number of obs = 109
Group variable: countryname1 — Number of groups = 28
R-sq: within = 0.0459 — Obs per group: min = 1
between = 0.9950 — avg = 3.9
overall = 0.9907 — max = 4
Wald chi2(4) = 4234.01
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

lnGDPHH	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
mobile_BB_HH	0.1055764	0.0328357	3.22	0.001	0.0412196	0.1699333
yo	1.001858	0.0165125	60.67	0	0.9694941	1.034222
GFCF_Pct_G~H	2846.467	833.7194	3.41	0.001	1212.406	4480.527
EDHH	-1777.171	518.0855	-3.43	0.001	-2792.6	-761.7426
_cons	-0.0209499	0.1715255	-0.12	0.903	-0.3571337	0.3152339
sigma_u	0.0496536					
sigma_e	0.05183711					
rho	0.47849561	(fraction of variance due to u_i)				

Instrumented: mobile_BB_HH
Instruments: yo GFCF_Pct_GDP_HH EDHH Mobile_cellular_telephone_sub_HH

Table 9:

Table (9)	Hausman test 2			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	ivfe1	ivre1	Difference	S.E.
mobile_BB_HH	0.0771384	0.1055764	-0.0284381	.
GFCF_Pct_G~H	8455.623	2846.467	5609.156	1333.996
b = consistent under Ho and Ha; obtained from xtivreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtivreg				
Test: Ho: difference in coefficients not systematic				
chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)			= 17.68	
Prob>chi2 = 0.0000				
(V_b-V_B is not positive definite)				

Table 10:

Table (10)	To check whether endogeneity is really present;			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	ivfe1	fe1	Difference	S.E.
mobile_BB_HH	0.0771384	0.0280185	0.0491198	0.0225776
GFCF_Pct_G~H	8455.623	6493.144	1962.479	807.343
Population~y	0.0108421	0.0163139	-0.0054718	0.0025048
b = consistent under Ho and Ha; obtained from xtivreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)			5.91	
Prob>chi2 = 0.0151				

Table 11:

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	ivre1	re1	Difference	S.E.
mobile_BB_HH	0.1055764	-0.0060931	0.1116695	0.0198059
yo	1.001858	1.006192	-0.0043341	0.0046605
GFCF_Pct_G~H	2846.467	2520.292	326.1745	331.3558
EDHH	-1777.171	-1485.191	-291.9803	205.2858
b = consistent under Ho and Ha; obtained from xtivreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)			= 2.29	
Prob>chi2 = 0.3181				

International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Corporate Income Tax and Asset Pricing

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Abstract

This paper studies the theoretical implications of corporate income tax on asset pricing in a two-tree aggregate endowment economy. I study a mechanism through which corporate income tax could increase and decrease "portfolio risk" associated with the rebalancing motive in market clearing. I view an asset as a portfolio of stock and bond and the portfolio weights are related to financial leverage. The tax could decrease after-tax consumption from dividend (increases leverage), but also could increase tax shield and add to dividend (decreases leverage). Changes in dividend are responsible to the correlation between expected dividend growth and consumption growth and thus affect stock price/return. Overall, the model introduces the role of tax-induced portfolio risk on asset characteristics.

Keywords: Asset Pricing, Two Trees, Corporate Income Tax, Financial Leverage
JEL Classification Codes: G12

1. Introduction

In this paper, I examine a mechanism through which the corporate income tax could create tax-related risk of stock and affect its expected return. I consider an asset as a portfolio of stocks and bonds. Since the dividends and coupons are proportional to the values of stocks and bonds, changes in tax is related to changes in the portfolio weights or financial leverage. Corporate income tax reduces after-tax consumption from dividend (increases leverage), but the reduction is mitigated by the amount of corresponding tax shield to add dividend (decreases leverage). Hence, the tax could either increase or decrease after-tax dividend and leverage, given the coupon payments from bonds. Choi and Kim (2012) document that changes in dividend are responsible to the changes in correlation between expected dividend growth and consumption growth and thus this “portfolio risk” affects stock price/return. [1] Hence, the investor has the incentive to rebalance its portfolio when the correlation increases due to increase in dividend (decrease in leverage). In addition to dividend shocks, the model I proposes implies that the exogenous corporate income tax alone could incur the “portfolio risk” and change prices of assets.

In particular, I provide a model based on the two-tree model studied by Cochrane, Longstaff, and Santa-Clara (2008) and Choi and Kim (2012). A representative investor is endowed with two sources of income streams, a dividend and a coupon payment from a stock and a bond, respectively. The Epstein-Zin (1989) and Weil (1989) recursive utility is adopted to characterize the investor's

[1] Change in the portfolio weights between assets due to dividend shocks is associated with the risk and affect equilibrium asset prices when the market clears. For example, a positive dividend shock causes a higher portion of the consumption in stock for the investor, and thus the correlation between their future dividend growth and consumption growth increases. This requires a higher expected return on stock in equilibrium.

preference. Most importantly, I extend the model by introducing the corporate income tax into a model. Portfolio weights or financial leverage, the relative holding between the stock and the bond, is the state variable and governs the whole model. Also, difference in the before- and after-tax leverage is important for this study because the change in leverage is related to the change in portfolio risk.

The theoretical implications provide that the tax-induced portfolio risk increases as tax shield increases (a lower leverage), but decreases as after-tax consumption decreases (a higher leverage). In particular, the model suggests that the tax could both increase and decrease the correlation between expected consumption growth and return on stock (or dividend growth) as the leverage decreases and increases. Consequently, the increase and decrease in the correlation would require a higher and lower expected return on stock and equity premium in market clearing. Overall, the model introduces a new source of risk emerging from the corporate income tax, and it helps better understand the role of the tax in asset pricing.

This paper adds to McGrattan and Prescott (2005) and Santoro and Wei (2011). McGrattan and Prescott (2005) demonstrate the quantitative implications of taxes on corporate income and distribution for the U.S. corporate values. They propose an explanation for the variation of equity values associated with changes in tax rates under a production economy. However, their deterministic model lacks provision for the risk-based implications of taxes for the equity premium. Santoro and Wei (2011) study how corporate income tax affects both the real economy and asset prices. However, their model relies on production-based asset pricing equilibrium and distortion of investment decisions due to the tax, but mine is based on the two-tree endowment economy focusing on changes in tax-induced risk in market clearing.

2. The Model

The representative investor exhibits the recursive preference (Epstein and Zin (1989) and Weil (1989)),

$$U_t = \left[(1-\beta) C_t^{1-\rho} + \beta (E_t (U_{t+1})^{1-\alpha})^{\frac{1-\rho}{1-\alpha}} \right]^{\frac{1}{1-\rho}} \quad (1)$$

Here, U_t and C_t is the utility and consumption at period *t*. α is the coefficient of relative risk aversion, ρ is the inverse of elasticity of intertemporal substitution (EIS), and β is a time discount factor. This characterization of utility disentangles the elasticity of intertemporal substitution and risk aversion. If α=ρ, the utility function implies the constant relative risk aversion (CRRA) of the investor.

As applying the model in Choi and Kim (2012), the investor is endowed with Tree S (Stock) and Tree B (Bond), which provide after-tax D_t and I_t units of dividend and coupon, respectively, for all *t*. The sum of these consists of the total consumption. The economy can be either in a "good" or "bad" state with probability 1/2 each. Depending on this aggregate shock, the gross growth rates of D_t and I_t are independent and identically distributed over time. Specifically, the dividend gross growth rates, D_{t+1} / D_t, for tree S between *t* and *t+1* are g_H^S with a probability of 1/2 + θ and g_H^S with a probability of 1/2 - θ when the state of economy is good. The rates are g_H^L with a probability of 1/2 - θ and g_H^L with a probability of 1/2 + θ when the state of economy is bad, where $g_H^S > g_H^L$ and 0< θ <1/2. This reflects that the dividend growth is more likely high when the economy is good and vice versa, which in turn characterizes more volatile dividend payout streams. By incorporating the fact that coupon payout streams are less volatile compared to dividend, the coupon gross growth rates, I_{t+1} / I_t, for tree B between *t* and *t+1* are g_H^B and g_L^B with equal probability of 1/2 when the economy is good

and bad, where $g_H^B > g_L^B$.[2] The state variable, s_t at period *t*, is $D_t / (D_t + I_t)$. Since dividend and coupon are portions of stock and bond values, 1 - s_t can be considered as financial leverage ratio, which is the key state variable for this study. Four possible states of the economy are characterized at each period as in Table 1.

Table 1: States of the Economy

State	D_{t+1}/D_t	I_{t+1}/I_t	C_{t+1}/C_t	Probability
1	g_H^S	g_H^B	$g_H^S \cdot s_t + g_H^B \cdot (1-s_t)$	$(1/2+\theta)\cdot(1/2)$
2	g_H^S	g_L^B	$g_H^S \cdot s_t + g_L^B \cdot (1-s_t)$	$(1/2-\theta)\cdot(1/2)$
3	g_L^S	g_H^B	$g_L^S \cdot s_t + g_H^B \cdot (1-s_t)$	$(1/2-\theta)\cdot(1/2)$
4	g_L^S	g_L^B	$g_L^S \cdot s_t + g_L^B \cdot (1-s_t)$	$(1/2+\theta)\cdot(1/2)$

The corresponding Euler equation for the price of stock at period *t* is

$$P_t = E_t\left[\beta\left(\frac{U_{t+1}}{\left(E_t\left[U_{t+1}\right]^{1-\alpha}\right)^{\frac{1}{1-\alpha}}}\right)^{\rho-\alpha}\left(\frac{C_{t+1}}{C_t}\right)^{-\rho}\left(P_{t+1}+D_{t+1}\right)\right] \tag{2}$$

Here, $\beta\left(U_{t+1}/\left(E_t\left[U_{t+1}\right]^{1-\alpha}\right)^{\frac{1}{1-\alpha}}\right)^{\rho-\alpha}\left(C_{t+1}/C_t\right)^{-\rho}$ is the stochastic discount factor. Dividing both sides of Equation (2) by C_t ,

$$\frac{P_t}{C_t} = E_t\left[\beta\left(\frac{\frac{U_{t+1}}{C_t}}{\left(E_t\left[\frac{C_{t+1}}{C_t}U_{t+1}\right]^{1-\alpha}\right)^{\frac{1}{1-\alpha}}}\right)^{\rho-\alpha}\left(\frac{C_{t+1}}{C_t}\right)^{1-\rho}\left(s_{t+1}+\frac{P_{t+1}}{C_{t+1}}\right)\right] \tag{3}$$

I define $P_t^* \equiv P_t / C_t$, $U_{t+1}^* \equiv U_{t+1} / C_{t+1}$, and $g^C \equiv C_{t+1}/C_t$. Since intertemporal stochastic characteristics of the price are dependent on s_t at each period *t*, Equation (3) can be expressed in terms of the Bellman equation

$$P^*(s) = E\left[\beta\left(\frac{U^*(s')}{\left(E\left[g^C(s')U^*(s')\middle|s\right]^{1-\alpha}\right)^{\frac{1}{1-\alpha}}}\right)^{\rho-\alpha}\left(g^C(s')\right)^{1-\rho}\left(s'+P^*(s')\right)\middle| s\right] \tag{4}$$

[2] In the model, the two trees have different average growths by reflecting dividend payoffs in aggregate are greater and more volatile than coupon payoffs, which are observed in the data. This leads to one tree with lower average growth and volatility than the other. For example, we may consider the tree with lower average growth and volatility as preferred stocks, which have properties of a debt instrument. Hence, the less risky tree with a lower growth in aggregate (broadly speaking) can be a part of bonds.

An important observation is that recursive variables are only dependent on the states of the economy, s and s', which denote s_t in this period and the next, respectively. Similarly, Equation (1) can be written as

$$U^*(s) = \left[(1-\beta) + \beta \left[E \left[g^C(s') U^*_{t+1}(s') \right]^{1-\alpha} \right]^{\frac{1-\rho}{1-\alpha}} \right]^{\frac{1}{1-\rho}} \tag{5}$$

Then, we can jointly solve for U and P given s from Equation (4) and (5) by utilizing value function iteration, following Choi and Kim (2012)

Data is only available for after-tax financial leverage, thus measuring implied before-tax leverage helps directly compare the models with and without the tax. My approach is simplified and straightforward because it can measure the before-tax leverage based on average tax rate and after-tax data, which are readily available. In particular, specifying the corporate income tax implies the following relationship

$$\begin{aligned} D_{t+1} &= (1-\tau)(C_{t+1}^{before-tax} - I_{t+1}) \\ &= (1-\tau) C_{t+1}^{before-tax} + \tau I_{t+1} - I_{t+1} \end{aligned} \tag{7}$$

, where $C_{t+1}^{before-tax} = D_{t+1}^{before-tax} + I_{t+1}$ and τ denotes the corporate income tax. $(1-\tau)C_{t+1}^{before-tax}$ and τI_{t+1} are the after-tax net consumption and tax shield, which are the part of after-tax dividend. In addition, $C_{t+1} = (1-\tau) D_{t+1}^{before-tax} + I_{t+1}$ and $D_{t+1}^{before-tax} = D_{t+1} / (1-\tau)$ should hold. Then, $s_{t+1}^{before-tax}$ can be expressed as $D_{t+1} / \left(D_{t+1} + (1-\tau) I_{t+1} \right)$. Dividing both the numerator and denominator of $D_{t+1} / \left(D_{t+1} + (1-\tau) I_{t+1} \right)$ by C_{t+1},

$$1 - s_{t+1}^{before-tax} = 1 - \frac{\frac{D_{t+1}}{C_{t+1}}}{\frac{D_{t+1}}{C_{t+1}} + (1-\tau)\frac{I_{t+1}}{C_{t+1}}} = 1 - \frac{s_{t+1}}{1 + \tau(s_{t+1} - 1)} \tag{8}$$

Notice that the before tax leverage is written in terms of the tax rate and after-tax leverage. When either τ = 0 or $s_{t+1} = 1$, $s_{t+1}^{before-tax} = s_{t+1}$. By defining $h' = s' / (1 + \tau(s' - 1))$, the before-tax price of stock in Bellman equation setup is

$$P^*(h) = E\left[\beta \left(\frac{U^*(h')}{\left(E\left[g^C(h') U^*(h') \middle| h \right]^{1-\alpha} \right)^{\frac{1}{1-\alpha}}} \right)^{\rho-\alpha} \left(g^C(h') \right)^{1-\rho} \left(h' + P^*(h') \right) \middle| h \right] \tag{9}$$

The Bellman equation for risk-free asset, which gives one unit of consumption with certainty, is

$$P^{f*}(s) = E\left[\beta \left(\frac{U^*(s')}{\left(E\left[g^C(s') U^*(s') \middle| s \right]^{1-\alpha} \right)^{\frac{1}{1-\alpha}}} \right)^{\rho-\alpha} \left(g^C(s') \right)^{-\rho} \middle| h \right] \tag{10}$$

Here, $P^{f*}(s) \equiv P^f(s) / C$ and f denotes the risk-free asset. See Choi and Kim (2012) for details.

The gross return on stock, R_{t+1}, by definition can be expressed as $(P_{t+1} + D_{t+1}) / P_t$. It is equal to $\left((C_{t+1} / C_t) \cdot (s_{t+1} + P^*_{t+1}) \right) / P^*_t$ and r_{t+1} denotes the net return on stock. Since four possible states of economy exist given s, four possible values of r_{t+1} are obtained and thus corresponding expected return

on the stock and its volatility could be quantified. Similarly, before-tax asset characteristics could be derived based on the state variable *h* instead of *s*. This eventually allows observation of how asset characteristics would be affected as we directly compare implications of the models with and without the tax. Moreover, we only need the after-tax measure of financial leverage and tax rate along with reasonable parameter values to quantify the model.

3. Theoretical Implications

Choi and Kim (2012) imply that a change in the relative proportion of portfolio holdings can affect risk and prices of assets in market clearing. In this model, the investor is concerned with the portfolio weights or financial leverage, the relative holdings between the stock and the bond. For example, a positive dividend shock causes the stock to provide a higher portion of consumption for the investor, and thus the correlation between future dividend growth (or return on stock) and consumption growth increases. This "portfolio risk" requires a higher expected return on stock in equilibrium. Also, stock prices are more sensitive to higher stock holding and lower leverage, because the risk-averse investor is reluctant to increase the portion of consumption containing volatile dividends. As a result, lower leverage is related to higher stock return volatility and higher expected return in market equilibrium.

Given the economic shock, the corporate income tax alone induces the portfolio risk because the tax can both increase and decrease the leverage. As demonstrated in Equation (7), the tax decreases after-tax consumption from dividend and thus increases the leverage after the coupon payment. This reduces the portfolio risk. Also, the tax decreases the leverage due to the tax shield in dividend and elevates the portfolio risk. Hence, this tax-induced portfolio risk could affect asset prices in equilibrium. In particular, we can see how the tax changes the level of leverage from combination of decrease in after-tax consumption and increase in tax shield by comparing before-tax and after-tax leverage. By rearranging Equation (8), we express the after-tax financial leverage in terms of the before-tax leverage and the corporate income tax, $1-s_{t+1}=1-\left(s_{t+1}^{before-tax}(1-\tau)\right)/(1-\tau s_{t+1}^{before-tax})$. This implies that the corporate income increases the after-tax leverage and may reduce the portfolio risk, ceteris paribus.

By using the definition of $s_{t+1}^{before-tax}$ and $C_{t+1}^{before-tax}$, we can further write the relationship between before-tax and after-tax leverages as

$$1-s_{t+1}=1-\frac{1}{1+\frac{I_{t+1}}{C_{t+1}^{before-tax}(1-\tau)+\tau I_{t+1}-I_{t+1}}} \tag{11}$$

This presents a mechanism that demonstrates how the corporate income tax affects the after-tax leverage (and thus the portfolio risk) due to change in after-tax consumption and change in tax shield. More importantly, Equation (11) allows a comparative analysis for each individual tax-induced change. Setting $C_{t+1}^{before-tax}(1-\tau)$ equal to $C_{t+1}^{before-tax}$ to eliminate the reduction in the after-tax consumption allows to see the individual effect of the tax shield on the after-tax leverage, $1-s_{t+1}$. Similarly, setting τI_{t+1} equal to zero allows examining the individual effect of the change in the after-tax consumption. This approach helps to compare each effect on asset characteristics without the tax in equilibrium. Overall, the model implies that the tax-induced portfolio risk increases as tax shield increases (a lower leverage), but decreases as after-tax consumption decreases (a higher leverage). The tax could both increase and decrease the correlation between expected consumption growth and return on stock (or dividend growth) as the leverage decreases and increases, as applying Choi and Kim (2012). Consequently, the increase and decrease in the correlation could require a higher and lower expected return on stock and equity premium in market clearing.

4. Concluding Remarks

In this paper, I explore the asset pricing implications of the corporate income tax in a stochastic two-tree endowment economy. The model is specified based on the two-tree framework in Cochrane, Longstaff, and Santa-Clara (2008) and Choi and Kim (2012). The corporate income tax could both increases and decreases the portfolio risk (destabilization and stabilization), the correlation between future consumption growth and return on stock (or dividend growth), and thus could affect characteristics of stock price. This theoretical implication demands further empirical study for more precise net offsetting effect. In sum, I introduce a new source of risk from the corporate income tax and highlight the importance of the tax in asset pricing.

Acknowledgement

This work was supported by the faculty research program 2013 of Kookmin University in Korea

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Detecting the Causality between Budget Deficit and Trade Deficit in Lebanon

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Abstract

This paper examines the link between government budget deficit and trade in Lebanon over the period 1975-2011. It uses cointegration and Granger causality tests to detect the short-run and the long-run relationships between the two deficits, and with other macroeconomic variables. The empirical results suggest that the budget deficit, the trade balance, the interest rate, and the exchange rate are cointegrated, suggesting the existence of an equilibrium relationship binding all these variables together. Besides, and most importantly, a bi-directional causality between budget deficit and trade deficit is detected, giving support to the "twin deficit" hypothesis.

Keywords: Trade Deficit; Budget Deficit; Cointegration; Causality.
JEL Classification Codes: F32; H62.

1. Introduction

The "twin deficit" phenomenon has obtained increasing attention from policy makers and researchers because, in most situations, it may harm economic growth. Until today, the twin deficit problem is one of the most controversial issues in economics. Different schools of thought have proposed different hypotheses about the relationship between government budget deficit and current account deficit. Sometimes, it is suggested that current account deficit could be the result of investment opportunities created by technical transformation, while in other times, it may be the result of a reduction in savings due to change in consumer expenditures, in tax rates, or in fiscal balance.

This study aims at reviewing the concept of twin deficit in the case of a small open economy, Lebanon. Our objective is to test the existing link between the internal (budget) deficit and the external (trade) deficit in Lebanon over the period 1975-2011. Note that both government budget deficit and trade balance in Lebanon witness persistent deficit, which may put pressures on economic growth. The study will try to detect the exact nature of the relationship between the two deficits in Lebanon: are they correlated or independent? Besides, determining the direction of causality between the two variables (if exists) allows help setting a macroeconomic policy of the country: which of the two deficits can be used as instrument and which is the objective? Finally, finding evidence of a long-term relationship between these two deficits may propose reconsidering the trading and the fiscal policies of the country.

The paper proceeds as follows. We present an overview of economic development in Lebanon in section 2. The review of literature is presented in section 3. We present and explain the exploited data in section 4. The empirical methodology is illustrated and the empirical results are presented in section 5. Finally, the conclusions of the paper and the policy recommendations are presented in section 6.

2. Overview of Economic Development in Lebanon Between 1975 and 2011[1]

The Lebanese economy is a typical model of a small, open, and service-oriented economy with extensive links abroad. It is characterised by an unrestricted exchange and trade systems, free access to foreign investment and perfect capital and labour mobility. Before 1975, the Lebanese economy was the most advanced economy in the Middle East, with high level of financial stability, which was the result of good economic performance, low inflation rates, stable exchange rate, absence of budget deficit, absence of public debt, and a persistent surplus in the balance of payments. Regarding its external sector, Lebanon has consistently experienced a deficit in the balance of trade. Nevertheless, the export/import coverage rate recorded an improvement during early 1970s, reaching 66% in 1974.

The eruption of the civil war in 1975 interrupted the course of economic progress in Lebanon. The impact of the war on the overall financial conditions and on public finances was very deep. Gradually, the government became incapable of collecting and administering public revenues to finance spending, and the situation turned from a budget surplus in 1974 into a deficit in 1975, which persisted afterwards. Budget deficit increased from $97 million in 1975 to $171 million in 1976, and jumped from $347 million in 1981 to $1,391 million in 1982 (Appendix A).

To finance the increasing budget deficits, the government resorted to issuing treasury bills bearing high interest rates (Appendix B). This led to a sharp expansion in the money supply causing high inflation rates. Besides, during the 1980s, the central bank of Lebanon resorted to printing money to help the government financing its budget deficit, which led to hyperinflation: the inflation rate jumped from 3.8% in 1983, to 25.3% in 1984, to 60.1% in 1985, to 146.8% in 1986, and to 741.2% in 1987. The hyperinflation re-emerged again in 1992, with an inflation rate of 110% (Appendix C). This hyperinflation was coupled with a sharp depreciation of the Lebanese pound (LBP). The exchange rate jumped from LBP 38.4/$ in 1986 to LBP 224.6/$ in 1987, with a gradual increase to LBP 928.2/$ in 1991, and a sudden hike to LBP 1,712.8/$1 in 1992 (Appendix D).

Lebanon is essentially an importing country with a free trading system. The deficit on the balance of trade had always been a characteristic of the Lebanese economy, and was usually offset by a surplus on the services and capital accounts in the balance of payments. The war reduced the country's ability to produce and export and the balance of trade and the balance of payments as a whole came under increased pressure. For instance, the imports/exports coverage rate dropped from 66% in 1974 to 22% in 1990, and the balance of payments started to record a deficit starting 1983. Regarding the trade balance, it recorded a deficit of $777 million dollar in 1975, which was equal to 5.6% of the GDP (at constant prices), increased to $2,512 million in 1980 (21% of GDP), and stood at $2,082 million in 1990 (21.8% of GDP) (Appendix E).

After the war had ended in 1990, the government adopted a policy aimed at achieving economic stability by controlling the budget deficit and reducing it gradually. Nevertheless, it was obliged to work on rebuilding the drastically damaged infrastructure, which involved huge expenditures on roads, electricity and water facilities, airport and seaports, telecom, etc... This has put more pressure on government budget, whose deficit surpassed $2 billion for the first time in 1996. Additionally, after 1992 the government resorted to borrowing to finance its expenditures on infrastructure (mainly from local markets) which resulted in mounting of public debt and debt service burden, increasing subsequently budget deficit. This was also coupled with an increase in government securities yield.

[1] Sources: central bank of Lebanon, Lebanese ministry of finance, the IMF, the World Bank.

After the war, exports started to grow again but at lower rates than imports. This caused the trade deficit to widen further. Consequently, the export/import coverage rate decreased from 16% in 1991 to 10% in 1995. The trade deficit reached $6,462 million in 1995 (38.1% of GDP), $6,287 million in 2001 (33.2% of GDP), and $15,086 million in 2011 (49.2% of GDP).

Finally, the worsening of all these macroeconomic variables has affected the economic growth in Lebanon mainly between 1975 and 1990. For instance, the GDP at constant prices dropped from $13,835 million in 1975 to $5,950 million in 1976, from $12,033 million in 1981 to $7,606 million in 1982, and from $13,095 million in 1988 to $7,536 million in 1989. This GDP reached $30,678 million by the end of 2011 (Appendix F).

3. Literature Review

3.1. Foundation of the Twin Deficit Theory

The literature proposes two main theoretical explanations for the link between budget deficit and current account deficit. The first approach is based on the Keynesian proposition and is in line with the early works of Mundell (1962) and Fleming (1963), which state that an increase in the budget deficit induces an upward pressure on interest rates, which attract foreign capital. Following this inflow of capital, exchange rate appreciates. Under a flexible exchange rate system, the appreciated exchange rate makes exports less attractive and increases the attractiveness of imports, worsening subsequently the current account. Whereas under a fixed exchange rate regime, the budget deficit generates higher real income or prices and this worsens the current account balance. In other words, budget deficit results in current account deficit under both fixed and flexible exchange rate regimes although the transmission mechanisms are different. The second approach assumes that the link between these two deficits is based on the Keynesian theory of absorption, where an increase in budget deficit allows an increase in domestic demand, which is partly met by imports of goods and services. These imports deteriorate the external balance.

A wide range of models has been developed to explain the link between the two deficits. In most cases, the results suggest that budget deficit is likely to lead to a deficit in current account. The national income identity provides a basis of the relationship between these two deficits. The national income identity model for an open economy is represented as follows:

$$Y = C + I + G + X - M \quad (1)$$

where Y = gross domestic product, C = consumption, I = investment, G = government spending, X = exports and M = imports.

Defining current account (CA) as the difference between exports (X) and imports (M), Equation (1) becomes:

$$CA = Y - (C + I + G) \quad (2)$$

where (C + I + G) are the domestic residents' spending (also called domestic absorption).

In a closed economy, saving is equal to investment (S = I). This implies that external account should equal the difference between national savings and investment, and that current account is directly related to saving and investment decisions in an economy (Lau et al., 2010). On the other hand, in an open economy, total savings (S) equal domestic investment (I) plus the current account balance CA:

$$S = I + CA \quad (3)$$

Equation (3) states that an open economy can obtain domestically and internationally the necessary funds for investments to boost its national income because external borrowing allows investment at levels beyond those financed through domestic savings.

Furthermore, national savings can be decomposed into private savings (Sp) and government savings (Sg).

$$Sp = Y - T - C \quad (4)$$

and

$$Sg = T - G \quad (5)$$

where T is the government revenue. Using Equation 4 and substituting it into Equation 1 and rearranging, we obtain:

$$CA = Sp - I - (G - T) \quad (6)$$

For simplicity, assume savings-investment balance, Equation (6) shows that a rise in budget deficit will increase current account deficit. In other words, Equation (6) states that the external account and fiscal balance are interconnected, or "twinned".

The empirical literature has examined the phenomenon of twin deficit in both developed and developing countries. The majority of those studies remain questionable with respect to the nature of relationship between the two deficits. However, four hypotheses arise from the twin deficit phenomena. In the following, we present an overview of the findings of the empirical literature regarding these four hypotheses.

3.2. Hypothesis I: Budget Deficit Worsens Current Account Deficit

The first hypothesis states that budget deficit will cause a similar deficit in the current account. Many authors have found support for this hypothesis. For instance, Hutchison and Piggott (1984) found that an increase in budget deficit is likely to raise domestic real interest rates, which in turn, raise the value of dollar and subsequently increase the trade deficit in the U.S. Zietz and Pemperton (1990) analysed the influence of U.S. federal budget deficit on trade deficit. They found that budget deficit does affect trade deficit, mainly through its impact on domestic absorption and income rather than through higher interest and exchange rates. Abell (1990) estimated a Vector Autoregressive system and showed that the link between the two deficits is indirect rather than direct: the causality runs from budget deficit to higher interest rate, to foreign capital inflow, to an appreciation of the exchange rate and finally to trade deficit. Bachman (1992) also used the Vector Autoregressive methodology and found that fiscal deficit determines current account deficits in the U.S. Akhtar (1995) stated that the significant increase in the U.S. external deficits during the 1980's was largely driven by fiscal deficits.

Bernheim (1988) used annual data for the United States, Canada, Mexico, West Germany, and the United Kingdom over the period 1960-1984 to investigate if fiscal deficits lead to trade deficits. The estimation results suggest that fiscal deficit does significantly affect trade deficit in those countries. Piersanti (2000) used the standard portfolio models and general equilibrium models to examine the relationship between the two deficits. His empirical results found that current account deficits have been associated with large budget deficits for most industrial countries during the 1970-1997 period. Ahmed and Ansari (1994) demonstrate that budget deficit and the gap between savings and investment explain the current account deficit in Canada.

Akbostancı and Tunç (2002) employed the Error Correction Model to study the relationship between budget deficit and trade deficit for Turkey between 1987 and 2001. They found a long-run relationship between the two deficits, and worsening of budget balance worsens trade balance. Also Acaravcı and Ozturk (2008) found positive and unidirectional causality running from budget deficit to current account deficit in Turkey. Using annual data for Greece, Vamvoukas (1997, 1999) tested causality relationships and found a unidirectional relationship going from fiscal deficit to current account deficit. Hakro (2009) implemented on data from Pakistan, a Vector Autoregressive model and demonstrated a causality link flowing from budget deficit to prices, to interest rate, to capital flows, to exchange rates, and finally to trade deficits. Iram et al. (2011) examine the relationship between budget deficit and current account deficit in Pakistan over the period 1971-2008, using Autoregressive distributed lag approach and find a stable long run effect of budget deficit on trade deficit.

3.3. Hypothesis II: the Ricardian Equivalence Hypothesis

The second hypothesis refers to the Ricardian Equivalence Hypothesis which bases on the seminal work of Barro (1974). According to this view, an inter-temporal shift between taxes and budget deficits does not impact real interest rate, the quantity of investment, or the current account balance. Therefore,

the absence of any causality between the two deficits would be in line with this hypothesis. According to the Barro-Ricardo Equivalence Hypothesis, financing deficit through debt or tax has no economic impact, which means that increasing internal deficit does not have any effect on external deficit (Barro, 1989). Empirically, Evans (1989) examined the relationship between fiscal deficits and trade deficits using data from Canada, France, West Germany, Italy, Japan, the United Kingdom, and the United States. He did not find a significant effect of budget deficit on the current account. This result confirms the Ricardian Equivalence Hypothesis. Bhattacharya's (1997) employs a Vector Autoregressive model and examines the factors affecting the trade balance of the U.S. over the quarterly period 1976:1 to 1995:4. He finds neither direct nor indirect effect of federal budget deficit on trade deficit. Kulkarni and Erickson (2001) also found no evidence of twin deficits in India, Pakistan and Mexico during the period 1969-1997. Finally, Kaufmann et al. (2002) examined the relationship between the two deficits in Australia and didn't find any causal effect between them.

3.4. Hypothesis III: Current Account Deficit Worsens Fiscal Deficit

The third hypothesis states that a unidirectional causality exists and runs from current account deficit to budget deficit. This occurs when deterioration in current account leads to a slower economic growth and hence, results in budget deficit. This is especially true for a small open economy that highly depends on foreign capital inflows to boost economic developments. In other words, large capital inflows or debt accumulations make that country eventually run into budget deficit. This reverse causality running from current account to budget deficit was called 'current account targeting' by Summers (1988), who pointed out that external adjustment may be required via fiscal policy.

Kearney and Monadjemi (1990) estimate Vector Autoregressive models for seven OECD countries and find a feedback relationship from current account to government spending in most of the countries. Using data from Egypt, Marinheiro's (2008) found a reverse causality from current account to budget deficit. Anoruo and Ramchander (1998) used Indian data from 1957 to 1993 and found evidence of unidirectional causality from trade deficit to fiscal deficit. Bose and Jha (2011) also examine the causal links between government budget deficit and current account deficit in India. Their results suggest a strong reverse causation running from external deficit to internal deficit.

Alkswani (2000) examined the twin deficit hypothesis in the Saudi Arabia economy over the period 1970-1999, and concluded that it may not be applied to an oil-based economy. He stated that the increase in current account position (driven by the surplus of trade balance) encourages the government to spend more causing a budget deficit. Similarly, Merza et al. (2012) examined the twin deficits hypothesis for Kuwait for the quarterly period 1993:4-2010:4. Like Alkswani (2000), they found that causality runs from current account to budget balance. They also find a negative long-run relationship between current account and budget balance and an increase in current account causes a decrease in government budget surplus.

3.5. Hypothesis IV: Budget Deficit and Current Account Deficit are Mutually Dependent

This hypothesis suggests that a bi-directional causality between the two deficits exists. Darrat (1988) proves the existence of this bidirectional causality between government deficit and trade balance in the U.S. Islam (1995) examined the causal relationship between budget deficit and trade deficit in Brazil from 1973:Q1 to 1991:Q4. Using Granger causality test, his empirical results showed a bidirectional relationship between the two deficits. Lau and Baharumshah (2004) reveal the presence of a bi-directional causality between the two deficits in Malaysia for the period 1975-2000. Finally, Mukhtar et al., (2007) used the Error Correction model and Granger causality tests to examine the twin deficit in Pakistan using data over the period 1975-2005. The authors confirmed the existence of a long-run bi-directional relationship between the two deficits.

3.6. Mixed Results

Khalid and Guan (1999) examine the causal relationship between budget and current account deficits for five developed countries (US, UK, France, Canada and Australia) from 1950 to 1994 and five developing countries (India, Indonesia, Pakistan, Egypt and Mexico) from 1955 to 1993. Their results suggest a more significant long-run association between the two deficits in the developing countries than for developed countries. Furthermore, they found that the direction of causality for India is bi-directional, whereas for Indonesia and Pakistan the causality runs from current account deficits to budget deficits.

Baharumshah and Lau (2009) examine the twin deficits hypothesis for seven East Asian countries. Their empirical results show that twin deficits hypothesis exists only in four out of the seven investigated countries. Lau et al. (2010) studied the twin deficits in the 1997 Asian crisis countries. Their empirical results showed that causality runs from budget deficit to current account deficit for Malaysia, the Philippines (pre-crisis), and Thailand. Conversely, they found that the causality runs in the opposite direction for Indonesia and Korea. Finally, they revealed a bi-directional causality for the Philippines post-crisis. Using data for the U.S. from 1975 to 1998, Hatemi and Shukur (2002) show that during the period 1975-1989, the direction of Granger causality was from budget deficit to current account deficit, while from 1990 until 1998 it was in the opposite direction.

4. Data and Descriptive Statistics

This paper uses annual data for the period 1975-2011, extracted from three sources: (1) the World Bank database (World Development Indictors), (2) the International Financial Statistics database (IFS), and (3) the Lebanese Ministry of Finance reports.

To examine the causal relationship between trade deficit and budget deficit, we use the following variables. The budget deficit (BD) is the difference between government revenues and expenditures. This variable is extracted from the reports provided by the Lebanese Ministry of Finance. The trade deficit (TD) is the difference between exports and imports of goods. This variable is retrieved from the World Bank database (World Development Indictors). The gross domestic product (GDP) is extracted from the World Bank database. GDP which is initially expressed in U.S. dollars at current prices has been converted to constant prices using the GDP deflator (the base year is 2005). The proxy for interest rate is the discount rate (DR), which is the only interest rates variable available for the period 1975-2011. This variable is retrieved from the International Financial Statistics database. Finally, the nominal exchange rate (NER) between national currency (the Lebanese Pound) and the U.S. dollar is also extracted from the International Financial Statistics database. The following table shows the evolution of the variables in selected years.

Table 1: The evolution of variables in selected years

	1975	**1990**	**2000**	**2011**
Trade deficit ($ millions)	777	2,082	5,515	15,086
Budget deficit ($ millions)	97	1,028	3,940	2,342
Gross Domestic Product ($ millions)	13,835	9,536	18,203	30,678
Discount Rate (%)	7	22	20	10
Nominal Exchange Rate (LBP/$1)	2.30	695.09	1,507.50	1,507.50

5. Estimation Methods and Empirical Results

The empirical analysis of the relationship between budget deficit and trade deficit will be done using the Vector Error Correction Models (VECM), a methodology which requires the estimation of many parameters. The employed methodology consists of trying to find out causal links among these variables using the VEC models and the methodology developed by Toda and Yamamoto (1995) on

Vector Autoregressive (VAR) models. The utilisation of data to detect the existence of a long-term relationship through the cointegration test is subject to conditions regarding the characteristics of the variables: all variables must be integrated of the same order. To test this characteristic, we must determine whether the variables are stationary in levels or not.

5.1. Estimation Methods

To detect the existence of a long-term relationship between the internal deficit and the external deficit, a preliminary test must examine the stationarity of the series under study. In fact, the non-stationarity of the series results in an invalidation of the classical inference procedures: the usual tests of significance of the coefficients (Fisher test or Student test) lying on the assumption of white noise residuals, are not verified. To test the stationarity of the different variables used in this study, we use the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests. They test the null hypothesis (H_0) of the existence of unit root against the alternative hypothesis of non-presence of unit root in the series. The estimation procedure involves estimating the following three models:

Model 1: a model with constant and deterministic trend

$$\Delta y_t = (\rho - 1)\, y_{t-1} + \beta t + \sum_{j=1}^{p-1} \phi_j \Delta y_{t-j} + \alpha + \varepsilon_t \tag{6}$$

Model 2: a model with constant but without deterministic trend

$$\Delta y_t = (\rho - 1)\, y_{t-1} + \sum_{j=1}^{p-1} \phi_j \Delta y_{t-j} + \alpha + \varepsilon_t \tag{7}$$

Model 3: a model without constant or deterministic trend

$$\Delta y_t = (\rho - 1)\, y_{t-1} + \sum_{j=1}^{p-1} \phi_j \Delta y_{t-j} + \varepsilon_t \tag{8}$$

With $\Delta = 1 - L$ (L is the lag operator), y_t is the considered series at time t, t is a trend, and ε_t is a white noise.

We test the null hypothesis of existence of unit root (the series is integrated of order 1, i.e. non-stationary) against the hypothesis of absence of unit root (the series is integrated of order 0, i.e. stationary). If the unit root tests indicate that the series are *I(0)*, i.e. stationary in level, it is then necessary to perform the same tests but in first difference. If the tests reveal that the series are *I(1)*, the cointegration procedures and the Error Correction Model can be easily applied.

The cointegration test used in this paper is that of Johansen (1988, 1991). Johansen procedure focuses on the rank of the matrix P, which determines the number of cointegration vectors. Two statistics are proposed: the track test and the test of maximum eigenvalue. The track test is a test of relative maximum likelihood consists of calculating the following statistic:

$$TR = -T \sum_{i=q+1}^{N} \log\left(1 - \hat{\lambda}_t\right) \tag{9}$$

The tested null hypothesis is: $r \leq q$, i.e. there is at most r cointegration vectors. This is about testing the rank of the matrix P, since testing the existence of r cointegration vectors is about testing the null hypothesis: *Rank* (*P*) = *r*.

Regarding the test of maximum eigenvalue, the test statistic is given by:

$$VP_{\max} = -T \log\left(1 - \hat{\lambda}_{q+1}\right) \tag{10}$$

In the case where the hypothesis of cointegration is validated, the model can be written, as shown by Engel and Granger (1987) and Johansen (1988), under the form of a VECM representation:

$$\Delta y_t = \mu_1 + \sum_{i=1}^{k-1} \alpha_i \Delta y_{t-i} + \sum_{i=1}^{k-1} \beta_i \Delta x_{t-i} + \lambda EC_{t-1} + \varepsilon_t \tag{11}$$

$$\Delta x_t = \mu_2 + \sum_{i=1}^{k-1} \alpha_i' \Delta y_{t-i} + \sum_{i=1}^{k-1} \beta_i' \Delta x_{t-i} + \lambda' EC_{t-1} + \varepsilon_t' \quad (12)$$

where ε_t and ε_t' are two white noises, EC_{t-1} is the estimated residual of the cointegration relationship lagged one period, and the coefficients λ and λ' represent the respective adjustment speed. The cointegration relationship reflects the long-term equilibrium and the short-run dynamics of variables capture the fluctuations around this long-term relationship.

The VECM representation provides two channels through which causality can be detected (Granger, 1988). Thus, in Equation (12), x_t Granger-causes y_t either through the lagged dynamic terms Δx_{t-i} if the coefficients β_i are jointly significant (i.e. the hypothesis $H_0 : \beta_1 = \beta_2 = ... = \beta_{k-1} = 0$ is rejected), or through the error term EC_{t-1}, if the coefficient λ is statistically significant (i.e. reject $H_0 : \lambda = 0$). The joint significance of coefficients β_i indicates Granger causality in the short-term, while the significance of the coefficient λ suggests a long-term Granger causality among the variables. Furthermore, in Equation (13), if the hypothesis $H_0 : \alpha_1 = \alpha_2 = ... = \alpha_{k-1} = 0$ is rejected and/or the hypothesis $H_0 : \lambda' = 0$ is rejected, then y_t Granger-causes x_t.

5.2. Empirical Results

The first step of the analysis is to determine the order of integration of the exploited variables. To do so, the unit root tests on each variable are performed. The results of stationarity tests in levels and first difference are presented in Tables (2) and (3).

Table 2: Results of Augmented Dickey-Fuller (ADF) and Philips Perron (PP) tests in level

Variables	Model with constant and trend (1)		Model with constant but without trend (2)		Model without constant or trend (3)	
	ADF	**PP**	**ADF**	**PP**	**ADF**	**PP**
TD	-0.4920	-0.7252	1.4488	1.5738	2.9033	3.0860
BD	-3.4859	-3.2622	-1.9309	-1.7856	-0.4903	-0.2612
DR	-1.1581	-0.9986	-1.5947	-1.7361	-0.4213	-0.4678
NER	-0.8401	-1.3446	-0.9813	-1.0745	0.1060	0.2760
GDP	-2.1710	-3.2866	-0.2492	0.5155	0.9261	2.2516

Notes: Model (1): the critical value is equal to -3.45 at the 5% level. Model (2): the critical value is equal to -2.89 at the 5% level. Model (3): the critical value is equal to -1.95 at the 5% level. These critical values are taken for a maximum number of observations T=100.

The results of Augmented Dickey-Fuller test and Phillips-Perron test presented in Table (2) suggest the non-stationary of variables in level. The t-statistics are greater than the critical value at the 5% level. Therefore, we do not reject the null hypothesis of the presence of unit root. When we perform the same tests on the first-differenced variables (see Table 3), we reject the null hypothesis of the existence of unit root for all of the three models at the 5% level. We obtain generally better results for the Phillips-Perron test, which rejects the non-stationarity at the 1% level in most cases. We conclude that our variables are stationary in first difference and thus are integrated of order 1. The order of integration of the series is 1, thus the procedures for cointegration and for the Error Correction Model can be applied.

Table 3: Results of Augmented Dickey-Fuller (ADF) test and Philips Perron (PP) test in first difference

Variables	Model with constant and trend (1)		Model with constant but without trend (2)		Model without constant or trend (3)	
	ADF	PP	ADF	PP	ADF	PP
TD	-5.3390	-5.3424	-5.0474	-5.0782	-4.3391	-4.5944
BD	-7.2665	-7.5644	-7.3429	-7.6388	-7.3330	-7.5662
DR	-4.9547	-6.4864	-4.6725	-4.5713	-4.7367	-4.6448
NER	-3.9240	-3.9055	-3.9265	-3.9265	-3.7505	-3.7505
GDP	-5.7061	-8.8903	-7.2547	-8.6170	-6.7781	-6.6612

Notes: Model (1): the critical value is equal to -3.45 at the 5% level. Model (2): the critical value is equal to -2.89 at the 5% level. Model (3): the critical value is equal to -1.95 at the 5% level. These critical values are taken for a maximum number of observations T=100.

Given the results of unit root tests, cointegration tests were performed to detect the existence of a stable long-term relationship between trade deficit, budget deficit, interest rate, GDP, and exchange rate. The choice of the optimal number of lags is obtained from the AIC, FPE and maximum likelihood tests. All these tests conclude a differenced VAR with lag. Johansen tests are based on the estimations of maximum likelihood of a VAR of order 1. We therefore test the null hypothesis of absence of cointegration vector against the alternative hypothesis of existence of one cointegration vector. The results of the Johansen cointegration tests are reported in Table 4.

Table 4: Unrestricted Cointegration Rank Test (Trace)

Hypothesized N° of CE(s)	Eigenvalue	Trace Statistic	0.05 critical Value	Prob.**
None *	0.6068	94.2494	88.8038	0.0190
At most 1	0.5152	61.5762	63.8761	0.0769
At most 2	0.4470	36.2290	42.9152	0.1980
At most 3	0.2723	15.4933	25.8721	0.5337
At most 4	0.1173	4.3673	12.5179	0.6885

Notes: Trace test indicates 1 cointegrating equation at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.

The results in Table 4 reveal the existence of a single cointegration relationship among the variables. This result does not precisely indicate which one of these variables is the dependent variable and which can be considered as exogenous. To ensure the stability of our results, we have repeated the cointegration test considering in each time one of the used variables as a dependent variable. Regardless of the chosen "dependent variable", the obtained results coincide to validate the existence of a single cointegration relationship among the variables included in the model. The existence of a cointegration relationship allows estimating a VEC model in order to describe the dynamic adjustment of variables towards their long-run equilibrium. The Error Correction Model allows then integrating the short-term fluctuations (the variables in first difference) around the long-run equilibrium given by the cointegration relationship.[2] To determine the direction of causality among the different variables, we apply a Granger causality test for a two-period lag. The estimation results are reported in Table (5).

Table 5: Results of causality test among the different variables

	ΔTD	***ΔBD***	***ΔDR***	***ΔNER***	***ΔGDP***
EC(-1)	-0.3509 [-5.8854]	0.0450 [0.8592]	0.0002 [0.6876]	-0.0271 [-2.1154]	0.0167 [0.0787]
ΔTD(-1)	-0.0433 [-0.2896]	0.0039 [0.0311]	0.0011 [1.8036]	-0.0315 [-1.0157]	0.0708 [0.1381]

[2] As demonstrated by Granger (1981), there is reciprocity between cointegration and Error Correction Model in the case of cointegrated series of order (1, 1), i.e. *I(1)* series whose residual of the linear regression is stationary.

Table 5: Results of causality test among the different variables (*continued*)

$\Delta TD(-2)$	-0.2821 [-1.9918]	0.2435 [2.0299]	-0.0007 [-1.1215]	0.0204 [0.6936]	-0.0880 [-0.1810]
$\Delta BD(-1)$	0.6061 [2.6303]	-0.5096 [-2.6112]	-0.0019 [-1.9811]	0.0027 [0.0573]	-0.5879 [-0.7433]
$\Delta BD(-2)$	0.4573 [1.8679]	-0.3900 [-1.8746]	-0.0019 [-1.8505]	0.0172 [0.3376]	-1.3195 [-1.5649]
$\Delta DR(-1)$	-10379.8969 [-2.2412]	13.7709 [0.3524]	0.3305 [1.7387]	-19.3253 [-2.0181]	-150.5639 [-0.9506]
$\Delta DR(-2)$	-12707.1974 [-2.3296]	41.4176 [0.9016]	-0.0031 [-0.0138]	-0.0640 [-0.0056]	26.8266 [0.1441]
$\Delta NER(-1)$	-2.5398 [-2.5959]	1.2035 [1.4442]	0.0034 [0.8368]	0.3340 [1.6356]	-1.9228 [-0.5693]
$\Delta NER(-2)$	-0.5517 [-0.5403]	-1.1904 [-1.3675]	-0.0017 [-0.4025]	0.0133 [0.0625]	2.4590 [0.6970]
$\Delta GDP(-1)$	0.1507 [2.3733]	0.0286 [0.5191]	0.0001 [0.4671]	0.0237 [1.7553]	0.1701 [0.7618]
$\Delta NER(-2)$	0.1247 [2.3347]	0.0307 [0.6661]	0.0002 [0.9713]	0.0099 [0.8756]	-0.0560 [-0.2997]
C	-448.6908 [-2.8934]	-91.7278 [-0.6951]	-0.2728 [-0.4250]	6.2882 [0.1944]	314.9659 [0.5889]
R^2	0.68	0.39	0.45	0.39	0.19
Jarque-Bera test	1.14 (0.56)	1.30 (0.52)	0.49 (0.00)	2.27 (0.32)	0.24 (0.88)
White homoscedasticity test			343.03 (0.29)		

Note: Student ratios for the estimated coefficients are between brackets. We present the test statistics of Jarque-Bera test and White homscedasticity test, and between parentheses are the probabilities of committing Type-I error.

The robustness of the model is evaluated by the Jarque-Bera test and the White homoscedasticity test, and we conclude that the model passes these tests. In addition, the explanatory power of the estimated equation – measured by the coefficient of determination – is high. The results reveal that the coefficient of the Error Correction term (the past residuals) or the restoring force coefficient is significantly different from zero at the 5% level with a negative sign. This result reinforces the existence of a long-term relationship among the variables. The economic interpretation of this result is that each time a deviation from the long-term relationship exists that unites the five variables, the trade balance consitutes the adjustment variable that allows restoring the equilibrium. The adjustment value indicates that approximately 35% of the disequilibrium of period *(t – 1)* is corrected in period *(t)*.

Looking at the trade balance equation ΔTD, we notice the existence of a causal link between the trade balance and the other variables. We observe that the trade balance is Granger-caused by itself and that the causality is negative and significantly different from zero at the 10% level. Conversely, the lagged budget balance positively causes the trade balance and this causality is statistically different from zero at the 10% level. This result seems to be in favour of the twin deficit conventional approach and reveals the existence of a close relationship between budget deficit and external deficit in Lebanon. We also observe that the lagged nominal exchange rate negatively causes the trade balance. The depreciation/devaluation of the national currency against foreign currencies results in a decline of domestic prices expressed in foreign currency and this in turn increases exports and reduces imports, thus reducing the trade balance deficit.

Conversely, we notice that GDP causes the trade balance with a positive sign and statistically significant at the 5% level. Thus, the additional wealth created in the economy in period *(t)* increases the trade deficit in period *(t + 1)*, widening further the gap between imports and exports. This phenomenon could be explained within the framework of a small open economy in two ways. On one hand, economic growth, even if it leads to an increase in exports, it increases more than proportionally the imports (since the overall effect on the trade deficit is positive). In fact, the increase in disposable income appears to cause a more than proportional increase in demand through its demand for imports

component. On the other hand, given the importance of the proportion of imports of consumption goods in total imports of Lebanon, the additionally created wealth and allocated to imports is spent on consumption rather than to investment. Therefore, the increase of wealth widens the trade gap in Lebanon. Finally, the interest rate causes the trade balance with a negative sign and significant at the 5% level. This result, somehow confusing, can be explained by the fact that the increase in fiscal deficit – which is often accompanied by an increase in interest rates – is translated into an increase in savings of economic agents and therefore, a decrease in domestic demand, implying a reduction in the trade deficit.

When considering the ΔBD regression, the results show that the fiscal balance is Granger-caused by itself and this causality is negative and significant at the 5% level. Besides, we observe a causal link, with a positive sign and statistically significant at the 10% level, running from external deficit to budget deficit. This result validates the existence of an interaction between budget deficit and external deficit. We notice here that there is no causal link between interest rate, exchange rate, GDP, and budget deficit.

Regarding the ΔDR equation, we notice that interest rate is Granger-caused by itself. The results also reveal the existence of an instantaneous positive causality running from trade deficit to interest rates, but with an opposite sign to that found in the ΔTD regression. We observe that the budget deficit negatively Granger-cause the interest rate and this causality is statistically different from zero at the 10% level. The results of the model reject any causal relationship between exchange rate, GDP, and interest rate. Finally, ΔNER and ΔGDP regressions show no significant causal link among the different variables. Therefore, we do not find a clear impact of the internal or the external deficits on the economic development in Lebanon.

6. Conclusion

This paper has examined the twin deficit phenomenon in Lebanon over the period 1975-2011. Using several econometric tests (cointegration and Granger causality), we tried to detect the short-run and the long-run relationships between government budget deficit and trade deficit. The empirical results reveal that budget deficit, trade balance, interest rate, and exchange rate are cointegrated, suggesting the existence of an underlying equilibrium relationship binding all these variables together. Secondly, a two-way causality between budget deficit and trade deficit was detected, giving support to the twin deficit hypothesis. Thirdly, an increase in both interest rate and exchange rate lowers trade deficit.

From policy perspective, our results suggest the following: (1) a depreciation/devaluation of the local currency could help lowering trade deficit (this suggestion has a negative repercussion though), (2) economic growth must be accompanied with a trade policy that controls imports and direct the resulting increase in local demand towards local production, and (3) stimulating national savings could reduce domestic demand on imports, thus narrowing trade gap.

Acknowledgement

This work was supported by a grant from the National Council for Scientific Research (CNRS), Lebanon.

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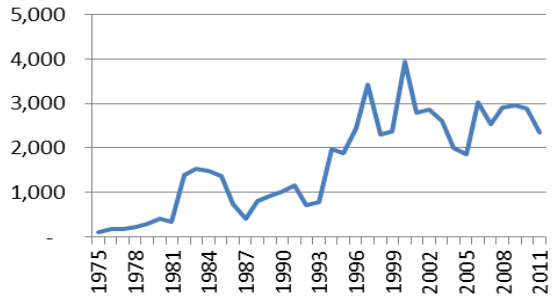
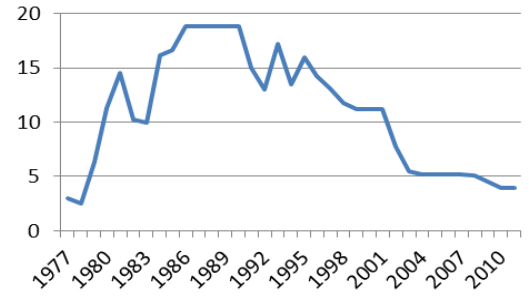
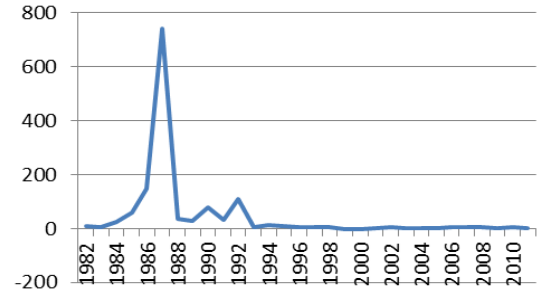
Appendix A: Budget Deficit ($million)



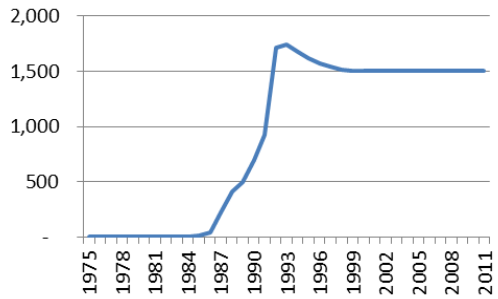
Appendix B: 3- month T-bill rate (%)



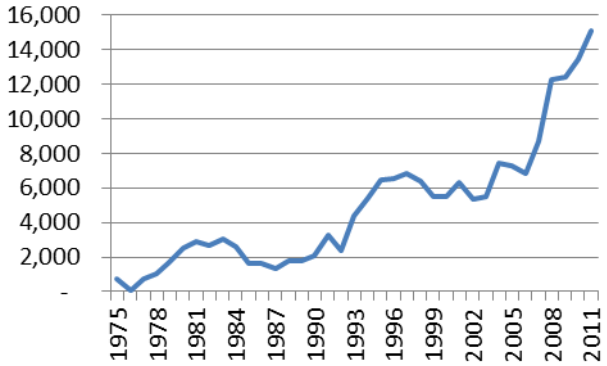
Appendix C: Inflation Rate (%)



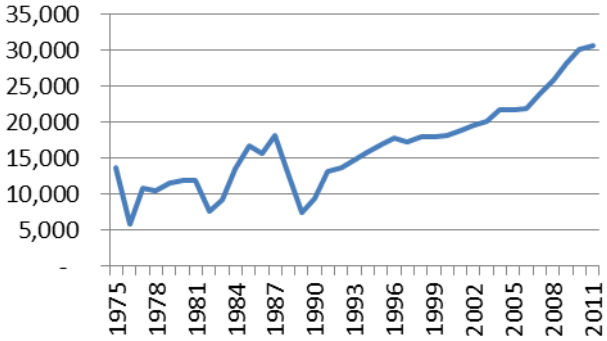
Appendix D: Exchange rate (LBP/$1)



Appendix E: Trade Deficit ($million)



Appendix F: GDP at Contant 2005 Prices ($million)



International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

The Role of Financial Intermediation in Domestic Savings: Evidence from Savings and Credit Cooperative Societies in Tanzania

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Abstract

This paper determines how Savings and Credit Cooperative Societies (SACCoS) play a role in domestic savings. Panel data from 21 regions of Tanzania mainland, for the period of 2005-2012, published by the Ministry of Agriculture, Food and Cooperatives, are used. The study uses panel data regression model in analysis. Findings show that, the contributions of SACCoS sub-sector in financial intermediation and households' savings are commendable. Numbers of SACCoS and number of members are positively affecting the level of savings and highly significant. However increase in number of SACCoS and members increases savings to a certain limit where savings start to diminish. Also external sources of funds show negative and significant effects to savings. Other significant factors include year, and gross loan portfolio. The government and policymakers need to develop more conducive environment for economic development and for people to join SACCoS so as to promote domestic savings. Also the linkage between SACCoS and formal financial institutions like commercial banks should be reviewed for the sake of building strong internal saving capacities.

Keywords: Tanzania, Savings, SACCoS, Microfinance, Cooperatives, Financial intermediation, Economic Development and Poverty

1. Introduction

Capability to save shows how a country can invest and utilize its recourses efficiently (Onchangwa & Memba, 2012). However it is widely accepted that as one is thinking about development, he/she should as well think about the role of savings in the economic growth (Deaton, 2005). Therefore savings is broadly established as the most crucial element in developing welfare of the people in all economies. This means that level of saving of a county determines its level of investment, production, employment, trade, security for its resources and hence economic development. In the developing countries in particular, saving is important not only to reduce risks as people have low income, but also to ensure capital formation as a mean of reducing the saving gap which is a threat to their development (Onchangwa & Memba, 2012; Kabete, 2008; Deaton, 2005).

Moreover, the ongoing worldwide financial crisis has proved the need for the individual countries to build their internal capacities. This is more serious in the developing countries which for long time have been depending on donor funding to finance their budgets. Logically it's not easy if not impossible for the developed countries to continue donating in the same ways they use to do to the developing countries while their own budgets are shrinking. Various scholars observed this situation, for example, Griffith-Jones and Ocampo (2009) explained that the ongoing financial crisis leads to fall in investment and economic activities in the developing countries particularly in Africa. Obviously these are results of reduction of financial aids from the developed countries and also fall in demand for export goods from the developing countries in the developed countries. As well Ngowi (2010), using Tanzania as a case study, indicated that, the current financial crisis manifested in 2008, and one of its extensive effects is reduction of the Official Development Assistance (ODA) to the developing countries. Generally both of them indicate that the main solution for this is to build internal economic capacity, which should be through strengthening domestic savings.

In Tanzania domestic savings is very low. According to the World Bank report of 2012, the gross domestic savings per GDP were 10.1, 17.9 and 17.0 percents and gross national savings per GDP were 13.2, 20.4 and 21.2 percents for the years 2000, 2009 and 2010 respectively. Though there was indication of growth of savings but still it is low. Probably domestic savings continue to be low in Tanzania because of wide spread of poverty and poor financial structures, among other reasons. However the level of domestic investment continues to be low because of the low level of domestic savings rates. On the other hand the Tanzania Development Vision 2025 indicate that the government continues to develop financial sector and improve livelihood as whole to empower majority, which can be translated as means to improve internal capacity including domestic savings.

Therefore despite the fact that there are many ways or models which narrate how savings is conducted, this study focuses on the relevance of SACCoS model in mobilizing domestic savings. SACCoS are microfinance financial institutions (MFIs) which are useful in financial intermediation especially in rural areas (Temu & Ishengoma, 2010; Bee, 2007; Randhawa and Gallardo, 2003). In this way SACCoS offer ideal opportunity to the majority of people in Tanzania to get financial services. One of the main financial services they offer is accepting deposits which are important means of mobilizing households' savings. To my understanding no specific study analyses the role of SACCoS in households' savings particularly in Tanzania.

This paper analyzes the role of SACCoS sub-sector in saving mobilization as a model for economic development and poverty reduction in Tanzania. Two questions are answered in this paper. First do SACCoS contribute to domestic savings? And second what determines the rate of savings in SACCoS? Therefore the paper makes four main contributions; firstly, it shows the role of cooperative societies in economic development and poverty reduction, secondly it shows the nature and status of SACCoS savings in Tanzania. Thirdly it shows the effects of linkages between SACCoS and formal financial institutions like commercial banks. Fourthly it shows the importance of financial system development in economic development mainly in developing economies. As a result cooperative based microfinance institutions are viewed and considered as the remedy for poverty in this paper.

2. Literature Review

2.1. Relevance of Savings in Economic Development

Generally, there is a consensus among the economic development theorists that capital formation is the key way for the economic development. This implies that low economic development and poverty in developing countries is largely a result of low financial capital. Therefore in this argument the key way for economic development is to fill up the saving-gap and trade-gap (Randhawa, 2012; Kabete, 2008).

Basically foreign aids and domestic savings are believed to be the solution to capital formation. For this reason some economists like Randhawa (2012) judged that the developing countries need much support from developed countries so as to increase their capital formation and technology. This has been practiced for long time. But there are recent researches including Kabete (2008) and Rodrick (1998) which gave evidences that receiving much foreign aid is not a guarantee to economic development. Due to this, currently most economists insist that the domestic savings is much important in the capital formation and national development. And it seems as it is the main growth path which has been ignored in developing countries.

Besides this, most of the developing countries like Tanzania make nearly all of their productive investments using foreign loans or aids (Kabete, 2008). This method of development has been proved to be unsustainable and less effective in development process. For example poverty remains an agenda in Tanzania since its independent in 1961, despite the supports that she has been receiving from the developed countries all these years. Probably there are many reasons for this, but just in summary: firstly foreign loans are tied with conditionality which sometimes is not helpful to the recipients. Secondly the accessibility of foreign loan is uncertain and may not be easy to get when required or may not be received in the same amount expected, as a results some plans would not be implemented as scheduled. Thirdly the recipient countries don't feel pinch on such resources which seems to be free of charge (by the time they are received), thus tend to be irresponsible and in most cases money is misused and involved in corruption.

Therefore while few researchers like Randhawa (2012) pointed that foreign aids have positive effect on economic development, on condition that there should be stable macroeconomic policy environment, many researchers like Lal (2012), Wangwe (2012), Kabete (2008), and Rodrick (1998), supported that external source of money is not sufficient for national economic development particularly in developing countries. Hence they insisted that domestic savings is crucial for the developments of a country.

Domestic savings can be at aggregate or individual level. Therefore it is categorized as household's savings, company savings and saving at the national level. All the three levels of saving are important in economic development and poverty reduction because they determine economic activities in both private and public sectors, by influencing the level of investment, employment and productivity in micro and macro levels (Aghion et al, 2009; Kabete, 2008; Deaton, 2005). In this manner current and future development is determined by the rate of saving by all three economic agents. Hence less savings implies poor economic growth and vice versa.

The Government (national level) saves out of its revenues which are mainly raised through tax collections, selling and hiring of national (public) properties (Lupumba, 1990). In developing countries, mostly the governments save less because of high demand for development projects. In this situation they always have deficit budgets which are filled by foreign aids. Probably one of the reasons for low government revenue is low level of economic activities which results in low tax bases. In Tanzania, main source of direct tax is from employed people in formal sector, who are, probably not more than 30% of the total population as a results direct taxes collection is small. On the other side, indirect tax cannot be high not only because of economic inefficient (Itriago, 2011) and poor tax administration (Curtis et al, 2012), but also because the level of consumption is low since people are poor. In this way the country continues in poverty pool with no hope of development because of less internal financial sources.

The Household savings is important because it stimulates local investment and productivity and consumption at a broad coverage (Lugauer and Mark, 2011; Deaton, 2005). Then it is a solution to both direct and indirect taxes which are the main sources of the government revenue. Also it stimulates the living standards of the majority people and raises accountabilities in resources use. In the developing countries, sometimes households' savings is traditionally done when people save through the assets like land, livestock and other things which have and store money values, due to poor financial infrastructures. But in broad thinking significant effect of saving in the economy to the society, is when it is done through financial institutions that accepts deposits from individuals. This is because saving through banks and other financial institutions is more convenient to stimulate investment, employment and economic growth since it gives an opportunity for capital to diffuse from surplus to deficit.

2.2. Role of Microfinance in Savings

In developing countries like Tanzania most of the people are poor and also most of the people reside in rural areas where formal financial institutions like banks are less accessible due to poor infrastructures (Bee, 2007; Kessy & Urio 2006). In this situation microfinance institutions proved to be more useful for financial services in most parts of the countries especially in rural areas. Microfinance institutions which are known as financial institutions for poor and low income earners basically provide deposit and credits services.

In Tanzania microfinance can be classified as non members based and member base microfinance. These two forms of microfinance differ somehow in how they fulfill their objectives. As a result the ways they contribute in economic development and poverty reduction is not uniform. The first form is nonmembers based microfinance like Non government Organizations (NGO's) which focus mainly on provision of credit to their clients and hence they look like mainly profit oriented. They do less in savings mobilizations. Indeed most scholar and practitioners agreed that microcredit is not ultimate solution for chronic poverty. However in some cases debts results in extreme poverty when they (debtor) fail to pay back the loan and forced to sell their remaining few properties to cover the debts. Then savings is the most important mean to empower poor people along with credits (Ellis et al, 2007; Tache, 2007).

Member based microfinance which the main one is SACCoS, are not essentially profit making organizations but mainly focus on welfare of their members (Ellis et al, 2007; Tache, 2007). They (SACCoS) promote saving among their members as they provide and ensure safe and convenient environment for their money (Mataba, 2010; Colombain, 1950). Probably they are much useful in rural areas where there is extreme poverty. In this circumstance we assume that the poor people are saving part of their earnings in SACCoS so as accumulate money to generate capital to start up and improve their small investments and to finance their basic needs like education, health, food and other likes. Therefore in SACCoS each individual is given opportunity to save out of his/her income.

2.3. SACCoS Savings Model

Historically SACCoS were developed to meet financial services specifically savings and credits to support the lower and middle class, so that they become economically active. This can be referred back from the founders of savings and credit societies in Germany, Friederich W. Raiffeisen and Herman Scheultze–Delitsche in 1846. Currently SACCoS sub-sector is growing fast in Africa and Tanzania in particular, carrying two flags of cooperatives and microfinance (Temu & Ishengoma, 2010; Bee, 2007; Tache, 2007; Lafourcade, 2005).

SACCOS are also known as cooperative-based microfinance because they provide financial services to low income earners and poor people. SACCoS are cooperatives because people willingly unite together and their common bonds vary from similar geographical location, similar employment and similar domination and other likes, which allows them to save their money and access credits. Members of SACCoS are the owners, controller of the institution(s) (Mataba, 2010; Colombain, 1950).

In Tanzania the governance, performance and growth of the institutions are on the hand of the members. On the other hand they are formed and managed under cooperative policy and cooperative law. Therefore the Government through the Ministry of Agriculture, Food and Cooperatives indirectly controls these cooperatives using policy, laws and provision of experts through cooperative department. This is important as it ensure that cooperatives fulfill their objectives of improving the lives of poor people through proper reallocations of scarce resources.

Apart from their uniqueness as cooperative institutions and ability to mobilize savings, like other forms of microfinance, SACCoS have gained popularity because they are available in all parts of the country especially in rural areas where formal financial institutions are not easily accessible. And they do not discriminate anybody based on his/her economic status. This is contrary to the formal financial institution where lenders needed valuable collateral, which most of the people don't have. In general SACCoS contribute into savings because they increase financial intermediations in the country and capture savings from low income earners and poor people, especially in rural areas which could have not reached by formal financial institutions (Bee, 2007; Ellis et al, 2007; Kessy & Urio, 2006).

2.4. Saving Mobilization in SACCoS in Tanzania

There are three ways in which SACCoS mobilize saving (see Table 1). The first is share, to be a member a person needs to contribute share. The maximum and minimum amount of share differs from one SACCoS to another but normally all SACCoS apply that as way of showing individual readiness to cooperate. According to the Tanzania SACCoS statistical reports, currently its (share) annual average growth is 24%. Because a share has maximum value (this depends with SACCoS memorandum), the growth of share is depending in the number of new members whereby if SACCoS is new it might raise more money from shares.

Table 1: Growth rate in SACCoS

	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	Average growth
Variables	**% growth**	**% growth**	**% growth**	**% growth**	**% growth**	**% growth**	**% growth**	**% growth**
SACCOS	8.2	71.1	29.5	18.6	1.5	1.2	2.1	18.9
Members	14.5	95.1	7.4	34.6	12.0	4.1	10.7	25.5
Share	-0.4	39.1	32.8	38.4	-2.0	12.4	48.7	24.2
Savings	81.3	42.7	14.6	76.6	58.4	35.9	36.5	49.4
Demand Deposits	20.4	52.3	2.1	52.1	35.4	14.4	50.8	32.5
Total savings	18.1	48.1	23.2	89.2	30.4	16.3	48.9	39.2

Note: calculations based on 2005-2012 Tanzania SACCoS statistical reports of the Department of Cooperative in the Ministry of Agriculture Food Security and Cooperatives.

Another form of saving is demand deposit. Here members save mainly to accumulate money to finance social services that require big amount of money which an individual cannot raise from income at once. Also it is to finance unexpected phenomenon which may distract the pattern of individual income, from Table 1 its average growth rate is 31% annually. For example people save to contribute for social cooperation like weddings, funerals, and other likes.

The last component of savings in SACCoS is known as saving (don't confuse with total savings which we basically referred to in this study). This is the most important form as the ability of individual member to borrow from SACCoS is determined by this form. As it is shown in the Table 1 in fact it is the one which contributes large part of total savings in SACCoS as its average growth rate is 49%. Then total savings are the summation of the three components of individual contributions in SACCoS, which is share, deposits and savings.

2.5. Relevance of Savings in SACCoS

Savings is relevant to SACCoS in the many ways. According to Okumu (2007), their relevance includes the following; first they are the means to identify potential members as they show willingness of a person to be a member. Second they act as collateral to members. As we already explained before in this paper (see section 2.4) individual savings determine the amount that individual member can get as loan. Third savings is an important financial service required by poor people and forth savings is source of cheap loans to member which is basically required by low income people. On top of these, generally savings are important in building internal capacity for individual person, SACCoS as an institution and national as a whole.

Apart from their internal savings, SACCoS get funds from commercial banks and other formal financial institutions (as commercial loans), government and donors, which they lent to their members. Moreover, External sources of funds have high cost because there is interest charged by banks which provide loan to SACCoS and also SACCoS themselves charge interests at least to cover operation expenses, so there is a double interest. This is contrary to the main objective of SACCoS of removing hardship to borrow (Mataba, 2010; Colombain, 1950), when members can set their own reasonable interest rate and keeps other borrowing conditions as lower as they agreed. Temu and Ishengoma (2010) supported this idea by insisted that the linkage between SACCoS and commercial banks is basically increasing cost by increasing interest in loans. Therefore these observations depict that members of SACCoS should save more to be dependent and more accountable for their economic development. In fact this is not a conclusion because some researchers like Piprek (2007) and Randhawa and Gallardo (2003), support the linkage by saying that it is important in expanding financial accessibility in rural areas. Then this paper also analyzes the importance of external sources of funds to the savings behavior in SACCoS.

2.6. Previous Empirical Studies

Most of the studies reported the role of SACCoS when generally studied microfinance industry. In this manner less description is given to SACCoS as it should be. In most cases, in African countries these institutions are considered young, because despite their long existence they remained without specific objectives and policies until in late 1980's in most. Despite this still their recognition is growing very fast in developing countries. In broad study of microfinance performance in Africa, Lafourcade (2005) reported that saving and credit financial institutions are speedily growing in number and members in most countries. This indicates the increase in households' savings and credit access among the people.

The report by Tache (2007) in Uganda, indicated that peasants are convinced and are increasingly empowering themselves by forming and/or joining financial institutions and saving together. The reported showed that there were increase in the formation of new SACCoS and increase in number of members. Onchangwa and Memba (2012) mentioned that SACCoS savings' is significant in investment. They explained that these cooperatives have linked borrowers and savers in Kenya, and provide their members with affordable saving and borrowing environment. Ellis et al, (2007), argued that the access to financial institution in Tanzania is low, and SACCoS have become the major form of financial institutions reachable by majority poor peoples in the country. Bee (2007) identified SACCoS as the main form microfinance in Tanzania. He pointed out that these institutions are among other microcredit institutions which are important in increasing access to financial services in rural areas. This is important so as to cover the gap left by formal financial institutions.

3. Data Sources

In this study we treat SACCoS at macro level by studying aggregate savings in all 21 regions in Tanzania mainland. We employ secondary panel data from the year 2005–2012. This information is obtained from the Ministry of Agriculture, Food and Cooperatives in Tanzania and therefore we believe that it is appropriate for public consumption. The information is all about financial services

accounts which include number of SACCoS, number of members, shares, deposits and savings. Therefore these are panel data as they combine both cross-sectional and time series data characteristics, because data for the same variables in all regions were published for year 2005 – 2012.

We add shares, deposits and savings together and we call total savings. Our assumption is that SACCoS are performing financial intermediation and hence the three components are internal sources of funds (inputs). Therefore dependent variable is total savings (values are in million Tshs) and independent variables are number of SACCoS and numbers of members which are the proxy measures of financial intermediation. Others independent variables are year, gross loan portfolio, and liabilities (see their description in Table 2).

4. Research Method

The analysis is based on the assumption that financial intermediation is the engine of economic development (Lee, 2005; Ndebbio, 2004; Akinboade, 2000) in any country through channeling of resources from where there is surplus to where there is scarcity. This is possible when financial institutions accept deposits and provide loans. Therefore, since accepting savings (deposits) is among the keys elements of financial intermediation, the expansion of financial system implies expansion of savings as well. The model is also built on the assumption that cooperatives based microfinance institutions continue to grow with time, shown by increase in number of SACCoS and number of members of SACCoS. Then as their name implies (saving and credit), it is logical to suppose that savings in these institutions increase with increase in number of institutions available and accessible to majority. In addition, we assume that increase in loan size due to increases of funds from internal and external sources, increases income of members and hence stimulate further savings, assuming that members of SACCoS make their savings in SACCoS only.

This study uses production theory to measure the role of financial intermediations to savings in SACCoS. Commonly, production function is used to determine the relationship between output and input both in short run and long run. The central idea is that, an increase in variable inputs increases output, and if other variables are fixed and one is variable (that is short run), it will result in diminishing return after certain point. We adopt this model assuming that households' savings depend on level of availability and accessibility of financial institutions. Therefore savings are dependent variable (output) and financial institution is independent variable (input). Then let input represented by X and Y is output, our model follow the formula bellow;

$$y = f(x) \quad \text{(model 1)}$$

To understand the impact of financial institutions we first use proxy x_1 which represent number of SACCoS and later x_2 representing number of members of SACCoS, thus we use the formula below (note that the procedure is the same so we are demonstrating only one, that is variable input is number of SACCoS (x_1) and number of members of SACCoS (x_2) is fixed):

$$y = f(x_1/\ x_2) \quad \text{(model 2)}$$

To determine the stage of savings in SACCoS average and marginal savings to calculate elasticity which is used to predict the stages, whether is in stage I, II or III. These are expressed as:

$$\text{Average Savings (AS)} = \frac{y}{x} = \frac{f(x1)}{x} \quad \text{(model 3)}$$

$$\text{Marginal Savings (MS)} = \frac{dy}{dx} = \frac{df(x1)}{dx} \quad \text{(model 4)}$$

$$\text{Elasticity (E)} = \frac{\%\partial y}{\%\partial x} = \frac{\partial y}{\partial x}.\frac{x}{y} = \frac{MS}{AS} \quad \text{(model 5)}$$

Whereby if;

E> 1 is stage I; shows that while other factors are constant, and only number of SACCoS are increasing, MS > AS, MS and AS are increasing and total savings (y) curve has positive slope.

$1 < E < 0$ is stage II; shows that while other factors are constant, and only number of SACCoS are increasing, AS > MS, MS and AS are decreasing (have negative slopes) but positive. Total savings (y) has decreasing positive slope.

$E < 0$ is stage III; shows that while other factors are constant, and only number of SACCoS are increasing, AS > MS is negative total savings (y) has negative slope (it has reached its limit therefore its heading downward).

As we assumed before in this section, Y=savings, X_1 = SACCoS and X_2 = members, then we adopt Gujarati (2004) to identify the general panel data regression model as in Model 6 and re-write the formula more specific in model 7. Where μ_{it} is the error term, represents variables which are not included in the model and β_i are coefficient of independent variable.

$$Y_{it} = \beta_{0i} + \beta_{1i} X_{1it} + \beta_2 X_{2it} \ldots\ldots + \mu_{it} \quad \text{(model 6)}$$

$$\text{Log } (Y) = \beta_{0i} + \beta_1 X_{1it} + \beta_2 (X_{1it})^2 + \beta_3 X_{2it} + \beta_4 (X_{2it})^2 + \mu_{it} \quad \text{(model 7)}$$

Then Model 7 is re-written as in Models 8 and 9 to measure the effects of financial institutions availability and accessibility.

$$\text{Log } (savings_{it}) = \log (Y_{it}) = \beta_{0i} + \beta_1 X_{1it} + \beta_2 (X_{1it})^2 + \mu_{it} \quad \text{(model 8)}$$

$$\text{Log } (savings_{it}) = \log(Y_{it}) = \beta_{0i} + \beta_2 X_{2it} + \beta_2 (X_{2it})^2 + \mu_{it} \quad \text{(model 9)}$$

Then we develop Model 10 which is general model and therefore includes all identified independents variables as they are described in Table 2.

Table 2: Independents Variables Description

Variable standard name	Description	Variable name in regression model	Variable description as used in regression model	Expected effects on savings/equity
Institutions	Number of SACCoS	SACCoS	Centered value of in each cases	+
Borrowers and depositors in SACCoS	Number of members	Members	Centered value of in each cases	+
Age of institutions	Year of data point	Year	Year	+
Gross loan portfolio	Credits in each year	Credits	Values (in millions Tshs)	+
External sources of funds	Liabilities	Liabilities	Values (in millions Tshs)	+

Then special attention is given to external sources of funds (liabilities) whereby it is assumed that increase in external sources of fund increases investment among the SACCoS members and in turn there is increase in savings (we also assume members continue to save in SACCoS).

$$\text{Log } (Y_{it}) = \beta_{0i} + \beta_{1i} X_{1it} + \beta_2 (X_{1it})^2 + \beta_3 X_{2it} + \beta_4 (X_{2it})^2 + \beta_{5i} X_{3i} + \beta_{6i} X_{4it} + \beta_{7i} X_{5it} \quad \text{(model 10)}$$

Note: X_1= SACCoS, X_2= members, X_3= Year, X_4= Credits X_5= Liabilities

We apply natural log in savings so as to rationalize data. Also Number of institutions (SACCoS) and number of members are raised to power to form quadratic model so that the model can predict diminishing return if at all is available.

We employ panel data regression model to estimate parameters of independent variables. In panel data, parameters can be estimated using fixed effect or random regression models (see Gujarati 2004). Then before deciding on which panel data regression model to use in each model we applied Hausman test. Following Guajarati (2004) explanations, we test the null hypothesis that both two estimations are substantially yielding the same coefficients and then we are supposed to use random effects model. The alternative hypothesis is that the fixed effects estimation is correct and the random effects estimation is not ok and in this case, we would see differences between the two sets of coefficients. Then probability value of chi-square is used to reject or not to reject null hypothesis. If the probability of chi-square is less than 5% (significant), null hypothesis that two methods are good enough is rejected in favor of the alternative hypothesis that one is satisfactory (fixed effects) and if

probability of chi-square is greater than 5% null hypothesis is not rejected in favor of random effects. Therefore we employ Hausman test to identify whether to use fixed effects or random effects model.

Table 3: Summary of Hausman fixed random test results

	Chi-square	Probability of chi-square	Decision
Model 8	5.17	0.075	Do not reject H_0
Model 9	19.9	0.00	reject H_0
Model 10	0.00	1.00	Do not reject H_0

From Table 3 we do not reject null hypothesis for model 8 and 10 and therefore we use random effects model in estimations. But we reject null hypothesis in model 9, hence we use fixed effects model. Also we estimate the coefficients of independent variables and test hypotheses at 95% confidence interval. Therefore in estimation process we start by testing number of SACCoS and members against Equity separately one after another; finally we combine all three independent variables together as in model 8, 9 and 10 respectively. So far the task is to measure whether numbers of SACCoS, number of members, age/year, loan portfolio/credits and liabilities have impact on total savings (Y). Then hypotheses are:

$H_{O:}\ \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$

$H_{a:}\ \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0$

To ensure that our models are safe from multicollinearity, before estimations we center and scale the original independent variable values by subtracting the means from the cases divided by standard deviation. Also because we are dealing with panel data we check for the presence of heteroskedasticity and we have no problem.

5. Results and Discussion

The dependent variable is total savings and independent variables are number of SACCoS and number of members. Others are year, loan portfolio/credits and liabilities. Table 4 present the correlation coefficient for dependent variable and independent variables.

Table 4: Summary of correlation coefficients

	SACCoS	Members	Credits	Savings	Liabilities
SACCoS	1				
members	0.7	1			
credits	0.6	0.7	1		
savings	0.5	0.6	0.7	1	
liabilities	2.8	0.3	0.6	-0.2	1

Table 4 reveals that generally there is moderate correlation between savings and number of SACCoS (+0.5) and number of members of SACCoS (+0.6)

In testing for hypothesis we start by testing the numbers of SACCoS against the savings, the summary of results are as in Table 5. The results indicate that number of SACCoS is is positive and a significant factor in savings. This implies that increase in number of SACCoS increases savings. On the other hand this has a limit after certain point. That means our model is quadratic model and shows that there is maximum point for increase in savings, *ceteris puribus*.

Table 5: Summary of random effect GLS regression

Dependent variable is log (Savings)			
Independent variable	**coefficient**	**z**	**P-value**
constant	8.497	14.87	0.00*

Table 5: Summary of random effect GLS regression - continued

SACCoS	1.6065	-6.27	0.00*
SACCoS square	-0.324	48.71	0.00*
Number of observation = 168 Number of groups = 21 Chi-square =229.12 Probability of chi-square = 0.000 R^2: Within = 0.61 Between = 0.44 Overall = 0.50			

* indicates significant at 1% significance level

Then we run the regression of savings and number of members, the results in Table 6 indicates that number of members is positive and a significant factor in savings. This gives the indication that, as more people join cooperatives microfinance institutions, it results to more savings. Again this is not a long term situation unless there is policy change to alter the situation. The main reason for this could be the link between SACCoS and formal financial institutions which is expanding with time as already suggested by Temu and Ishengoma, (2010), Nyamsogoro, (2010) and Piprek, (2007). When formal institutions like commercial banks give commercial loans to SACCoS, this might affect the saving behavior of the SACCoS members in long run.

Table 6: Fixed effect GLS regression

Dependent variable is log (Savings)			
Independent variable	**coefficient**	**t**	**P-value**
constant	8.58	124.36	0.00*
members	1.98	15.11	0.00*
members Square	-0.41	-9.73	0.00*
Number of observation = 168 Number of groups = 21 F (2, 145) =229.12 Probability of F = 0.000 R^2: Within = 0.61 Between = 0.56 Overall = 0.57			

* indicates significant at 1% significance level

Lastly is the general model which includes all the explanatory variables as shown Table 7.

Table 7: Summary of random effect GLS regression

Dependent variable is log (Savings)			
Independent variable	**coefficient**	**z**	**P-value**
constant	-290.6	-5.74	0.000*
year	0.15	5.90	0.000*
SACCoS	0.4	3.39	0.001*
members	0.68	4.77	0.000*
credits	0.000031	10.38	0.000*
liabilities	-0.000034	-11..60	0.000*
SACCoS square	-0.14	-3.57	0.000*
Members square	-0.19	-5.57	0.000*
Number of observation = 168 Number of groups = 21 Chi-square =966.29 Probability of chi-square = 0.000 R^2: Within = 0.87 Between = 0.74 Overall = 0.80			

* indicates significant at 1% significance level

The results show that total savings are increasing with increase of cooperative financial institutions (SACCoS). This is telling us that, generally on average, saving behavior is growing and domestic total savings is increasing because financial institutions are accessible to most of the people. On the other hand Increase in number of members increases the total saving and it is significant. That means the membership grows and the larger the number of members the more the total savings. Then what is required is to mobilize more people to join cooperatives as a model for households saving mobilizations. However as in the Tables 3 and 4, the results indicate that this trend has a limit, as indicated by coefficient of number of SACCoS square and number of members square. Year is significant and positively related to savings. This can be interpreted that older SACCoS have higher level of saving than new one. Also credits/loan portfolio has positive relation with savings and highly significant.

We use Liabilities to represent external sources of funds or total borrowing of SACCoS. The results show that liabilities are negatively related to savings and significant. This implies that increase in liabilities discourage savings.

Therefore this paper argues that the development of SACCoS sub-sector lead to increase in financial services particularly savings. Moreover the findings in this paper prove that cooperative microfinance institutions are very important in financial development. This observation is in agreement with (Mataba, 2010; Temu and Ishengoma, 2010; Tache, 2007, Lafourcade 2005; Randhawa, 2003; and Colombain, 1950) who generally mentioned that SACCoS play a major role in financial services. Also as explained by Onchangwa and Memba (2012), Lee (2005), Ndebbio (2004) and Akinboade (2000) financial development is vital in stimulating economic growth through savings, therefore mobilization of domestic saving is a good sign for economic development and poverty reduction in Tanzania.

6. Conclusion

SACCoS play a greater role in financial intermediation and hence relevant in domestic savings in Tanzania. Empirical results show that generally people continue to join SACCoS in each year and as number of membership increases savings also increases. But more importantly the results show that the trend of people to join SACCoS is increasing. This implies that many people have not been reached by financial institutions especially in rural areas. All these imply that SACCoS become important mobilizing force for households' savings. This is good for economic growth in Tanzania and poverty reduction processes. However the results signal that, the positive impacts that SACCoS have on the savings diminish after certain point. This can be associated with increasing linkage between SACCoS and formal financial institutions like commercial banks, which ruins the principles of SACCoS, by increasing SACCoS ability to lend while reducing their ability to mobilize savings. Also the results indicate that there is a positive relationship between savings and gross loan portfolio though it was not possible to identify casual relation in this paper. The results show that increase in Liabilities affects savings negatively which is contrary to our assumption and therefore it demonstrates that linkage between commercial banks and SACCoS ruins saving behavior in SACCoS.

The government, Policy makers, members of SACCoS and other stakeholders are required to strengthen the environment in cooperative based microfinance as they increase national capacity savings, bearing in mind that most of the population in Tanzania can best be saved with such institutions due to their level of income. This will help in building internal capacity which is important for country to be economically independent and hence increase its development speed through empowering domestic investments. The linkage between SACCoS and formal financial institutions like commercial banks should be reviewed for the sake of building internal capacities for individual members, SACCoS and nation as whole. Also being cooperative financial institutions, their principle should not be ignore, rather the main focus should remain to be outreach where more poor people especially in marginalized areas be reached.

7. Acknowledgment

The research is supported by the Ph. D. Programs Foundation of Ministry of Education of China (20090041110009), National Science Foundation of Ministry of China (71171032), and the central university special funds for basic research business expenses (DUT11RW202, DUT10ZD107).

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 108 April, 2013
http://www.internationalresearchjournaloffinanceandeconomics.com

Effects of Energy Prices on Sectors: The Case of Turkey

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Abstract

In this study, the effects of changing energy prices on Turkey's some of key sectors such as industry, transportation, service and food sectors were examined. Besides, the effects of changes in gold prices, US dollar exchange rate and interest rates were calculated. This study, where PDP (Public Disclosure Platform) indices were used, covers 2009-2013 period. In accordance with the analysis carried out, it is seen that increase in energy prices increases share earnings of the aforementioned sectors.

Keywords: Energy Prices, Sectors, Gold, Brent, Interest, Currency
JEL Classification Code: G10, G11

1. Introduction

Energy, which is a very important and critical input for social and economic development of countries, has a very large share in Gross National Product of most industrialized countries. Besides, historically there has been an increase in energy demand depending on increasing agricultural and industrial activities. On the other hand, it is seen that there have been profound price movements in energy markey on a global scale particularly in recent years. Especially in 2002-2007 period, fluctuations in international prices reached very high levels, oil and natural gas prices increased prominently along with high volatility. These increases in energy prices and volatility are thought to be detrimental. Concordantly, developmets experienced affect financial markets (Oberndorfer, 2009: 5787). For this reason, it is not surprising that the effect of changing energy prices on financial markets is one of the most debated topics within the literature.

When the literature regarding this matter is examined, it is possible to think that the effects of changes in energy prices (especially in oil prices) on financial markets can be classified as direct and indirect effects. Its direct negative effect is that any increase in oil prices causes uncertainty and it leads to decrease in share prices (Filis, 2010: 879). Its indirect negative effect is that any increase in oil prices leads to decrease in production levels and it increases the level of inflation. Any increase in energy prices primarily causes an effect which increases the costs and expenditures of transportation, production and heating. Besides, increases in oil prices affect discount rate used in equity pricing formulae as well. Increasing oil prices generally increase the interest rates of central banks and cause

inflationary pressures which they can control. Increasing interest rates makes bonds more attractive and it leads to decrease in share prices (Basher, Sadorsky, 2006: 226).

Besides, increases in oil prices generally affect investment decisions and this fact is possible to cause deferment in production. Moreover, such increases in oil prices affect customers for they cause increase in final goods and services prices. This situation decreases demand for final goods and services and causes profits to fall (Basher and others, 2010: 4-5). According to Oberndorfer (2009: 5787) however, the effects of changing energy prices on equity market can depend on the sectoral affiliation of relevant corporations.

Finally, it is necessary to express that there exist some industries which benefit from any increase in oil prices. One of these industries is energy industry. For instance, when oil prices increase, people tend towards seeking alternative energy resources and it causes increase in the number of alternative energy industries.

Turkey is located in a region between the Middle East and the Caspian Sea where abundant oil production is made. This strategic position makes energy very important to Turkey. On the other hand, there has been significant increases in energy consumption in Turkey whose growth rate and population increased considerably. For this reason, energy prices are of capital importance for Turkey as well. However, it is seen that there are only a handful of studies which examine the relationship between energy prices and financial markets with regards to Turkey. Also in this study, the effects of changing energy prices on share market earnings in Turkey and the relationship between the energy market and other industries will be examined.

2. Literature Review

As stated previously, energy markets and fluctuations in energy prices are one of the most debated topics in the literature. When we look at the previous studies, the relationships between fluctuations in energy prices and macro-economic variables, industries and financial markets were discussed through different approaches and methods.

In the first place, the relationship between changes in energy prices and economic growth was the subject matter of many studies in the past. For instance, Soytaş and Sarı (2003) analyzed the relationship between energy prices and economic growth using 1950-1992 figures of five developing countries (Argentina, South Korea, Turkey, Indonesia, Poland). Soytaş and Sarı (2003) found out that there is a relationship from energy prices to economic growth for Turkey and two-way causality for Argentine; they found out that cointegration vector is invalid for Indonesia and Poland. Yang (2000), who discussed the relationship between energy prices and economic growth in 1954-1997 period in Taiwan, concluded that there is a two-way relationship between the two variables. Paul and Bhattacharya (2004), who examined this relationship in 1950-1996 period in India, also concluded that there is a two-way relationsip. Lee (2005), who examined 1975-2001 period of 18 developing countries, concluded that there is a long-termed and steady relationship between energy prices and economic growth in these countries.

The relationship between changes in energy prices and share earnings started to be examined significantly especially after the oil crises in 1970's. For instance, when we look at the studies carried out for the United States and the UK, in a study carried out for the UK by Manning (1991) who examined changes between weekly data and changes in oil prices through a market model, it was concluded that changes in oil prices have positive impacts on share earnings of oil companies.

Using quarterly data, Jones and Kaul (1996) analyzed the reactions of international share markets to oil crises through changes in real cash flow in next period and/or changes in next period earnings. In this study, they concluded that share markets in Canada and the United States react considerably to oil price shocks, while this reaction is not that strong in the UK and Japan.

In a study carried out by Huang and others (1996), it was concluded that there is a strong link between share earnings of some American corporations and changes in oil prices.

Sadorsky (1999) examined the relationship between changes in oil prices and real share earnings in the United States using VAR analysis and monthly figures. As a result of this study, it was found out that changes in oil prices and oil prices volatility have a very significant effect on real share earnings. Besides, it was seen that volatility shocks in oil prices have an asymmetrical effect on economy. Especially positive oil price shocks have more significant effect on share earnings and economic activities compared with the negative shocks.

Kilian and Park (2007) carried out a study for the United States which covers 1975-2005 period. In this study, they found out that the reactions of share earnings differ significantly depending on the causes of oil price shocks.

It was seen that negative response of share prices, oil prices only emerge at times of increased oil prices resulting from demand shocks peculiar to oil market like an increase in cautionary demand resulting from the fear of inability to access to crude oil in the next period.

On the contrary, when there is an increase in oil prices caused by the global economic expansion, it was seen that there is a constant positive effect in cumulative share earnings. On the other hand, It was found out that oil and natural gas industries, like gold and silver mine industries, give a positive response to positive demand shocks peculiar to the oil market while automobile and retailing sectors give a negative response (Kilian, Park, 2007: 3).

Gogineni (2008), who examined USA share market and daily oil price changes using figures in 1983-2006 period, found out that changes in oil prices create a negative effect on share earnings when these price changes result from suppy shocks and that changes in oil prices because of changes in total demand create a positive effect on share earnings.

Henriques and Sadorsky (2008), who tested the empirical relationship between share prices of alternative energy resources, technology share prices, oil prices and interest rates, concluded that oil price shocks have little effect on the share prices of alternative energy resources.

The relationship between energy prices and financial markets in the countries of Cooperation Council for the Arab States of the Gulf (GCC), members of which are prominent oil producing countries, have been discussed in many studies. For instance, Rault and Arouri (2009), who examined the relationship between changes in share prices and oil prices in Cooperation Council for the Arab States of the Gulf (GCC) countries, concluded that there is a two-way relationship between the variables for Saudi Arabia. They concluded that changes in share prices in other countries except Saudi Arabia do not lead to any change in oil prices while changes in oil prices lead to changes in share price in these countries.

In addition, increases in oil prices cause the outputs, incomes and share earnings of companies in countries which are members of Cooperation Council for the Arab States of the Gulf (GCC) to increase (Rault, Arouri, 2009: 8).

Arouri and Fouquau (2009), who carried out a study using the monthly data of the period which covers 1996 January-2007 December of Cooperation Council for the Arab States of the Gulf (GCC) countries Kuwait, Oman, the United Arab Emirates, Qatar, Bahrain and Saudi Arabia, found out that oil price shocks affect stock index returns in an asymmetrical manner.

Ravichandran and Khalid Abdullah Alkhathlan (2010), who examined the effect of oil prices on the share markets of Cooperation Council for the Arab States of the Gulf (GCC) countries within the period of March 2008-April 2010, concluded that changes in oil prices have an effect on the share earnings of these countries in the long term.

Hammoudeh and Aleisa (2004) however showed that there is a two-way relationship between share earnings and changes in oil prices in Saudi Arabia.

On the other hand when we check the literature, it is seen that some studies on this matter have also been carried out for Far Eastern countries, European countries and Australia. For instance, Faff and Brailsford (1999) in their studies which covers 1983-1996 period of Australia tested the sensibility of oil prices on share prices. It was found out that energy prices in general terms and oil prices in special sense have an important effect on the costs of most companies. In this direction, it was seen that there is an important positive sensitivity for oil, gas and diversified resources while there is a negative

sensitivity for Paper and Packaging and Transportation industries. In addition, it was concluded that negative sensitivity is the case for the banking industry.

Ciner (2001) concluded that there is a statistically significant relationship between real share earnings and oil prices in the next period; but this relationship is not linear. Paparetrou (2001) however in a study carried out for Greece concluded that changes in oil prices have effects on real activities and employment.

Maghyereh (2004) carried out a study where 22 emerging economies were evaluated in accordance with their 1998-2004 periods. In this study, Maghyereh (2004) examined the relationship between oil prices and share earnings and concluded that there are very weak proofs regarding oil price shocks' effect on share earnings.

As the energy consumption intensity of countries increase, response to oil prices increases as well. Brychcy (2006), who examined the effects of oil price returns on different share markets in the world, concluded that oil prices have an effect on all stock markets but this effect emerge in different ways.

Park and Ratti (2008) carried out a study where they examined 12 European oil importer countries. In this study, Park and Ratti (2008) concluded that oil prices have a negative effect on stock markets. Miller and Ratti (2009), in their study which covers 1971-2008 period, concluded that changes in oil prices have a negative effect on stock markets in the long term.

Masih and others(2010), who examined the relationship between fluctuations in oil prices and economic activities using modern time series methods in a study which covers May 1998-January 2005 period of South Korea, concluded that oil price movements affect stock markets considerably. Besides, it was seen that after a shock in oil prices or oil price volatility, stock market shows an increase at first and it slows down thereafter.

Basher and others (2010), who examined the dynamic relationships between oil prices- increasing stock market share prices and oil prices-foreign exchange rate in January 1998- December 2008 period using Structural Vector Autoregression analysis, concluded that positive shocks in oil prices tend to decrease increasing stock market share prices and USA dollar exchange rate in the short term.

In this direction when we look at the studies carried out for Turkey, we see that many studies have been carried out which examine the relationship between energy consumption and Gross Domestic Product (GDP). For instance, Erdal and others(2008), who examined the relationship between energy consumption and real GDP in 1970-2006 period, concluded that there is a two-way relationship between energy consumption and real GDP. Accordingly, any increase in energy consumption directly affects economic growth and economic growth, on the other hand, increases energy consumption.

Soytaş and Sarı (2003) however concluded in a study covering 1950-1992 period that there is a one-way relationship between energy consumption and economic growth from the former to the latter.

Altınay and Karagöl (2004), who adapted Hsiao version of Granger causality method to Turkey, carried out a study covering 1950-2000 period and found out that there is not any relationship between energy consumption and economic growth. Similarly, Jobert and Karanfil (2007), who examined the relationship between sectoral energy consumption and economic growth according to their resources in Turkey within 1960-2003 period, also concluded that there is not any relationship between energy consumption and economic growth.

Lise and Van Montfort (2007) however, who carried out an analysis using monthly data of 1970-2003 period, concluded that energy consumption and GDP are cointegrated. It means that there is a (probably two-way) causality relationship between these two variables.

It stands out that the number of studies which examine the relationship between energy prices and financial markets in Turkey is very limited. For instance, Berk and Aydoğan (2012) carried out a study using daily Brent crude oil prices and Istanbul Stock Exchange(ISE)-100 index and benefited VAR analysis. In this study, they examined the relationship between changes in oil prices and share market earnings. As a result of this study, only a few proofs were found that the effect of shocks in oil

prices on Turkish stock market is evaluated rationally. In other words, changes in oil prices affect stock market activities significantly and rationally only during third sub-period.

Al-Fayoumi (2009) carried out a study using monthly data of December 1997-March 2008 periods of Tunisia, Jordan and Turkey and examined the relationship between oil prices, interest rates, industrial production and share earnings using VECM (Vector Error Correction Model). As a result of this study, it was found out that the hypothesis that oil prices cause a change in share earnings is invalid for these countries. On the other hand, it was put forward that the effects of local macro-economic variables in these countries on share earnings is more important than the effects of oil prices.

3. The Purpose of the Study and its Scope

The purpose of this study is to examine the effects of changes in energy prices on industry, transportation, service and food sectors. Within this framework, the effects of changes in gold prices, USA dollar exchange rate and interest rates along with oil prices on the share earnings of aforementioned sectors were analyzed benefiting from the daily data of 2009-2013 period.

4. Research Model and Implementation

In the first stage of this study, descriptive statistics which reflect characteristic features of each series were given. In the second stage, regression analysis was carried out. In this stage, the existence of main econometric problems was researched. These are Autocorrelation, Heteroskedasticity and Multicollinearity problems.

5. Analysis of Model

Table 1: Descriptive Statistic

	PRICEAU	PRICEBRENT	PRICEINTEREST	PRICEUSD
Mean	75807.12	93.10039	9.076910	1.621118
Median	73500.00	92.89500	8.890000	1.567000
Maximum	108100.0	126.1650	13.82000	1.916000
Minimum	45.60000	48.52000	6.860000	1.395000
Std. Dev.	20646.39	20.09047	1.291529	0.139338
Observations	903	903	903	903

Table-1 is shows the results of descriptive statistics which indicates characteristic features of each series. According to Table-1, PRICEAU varieble's mean value, median value, maximum value, minimum value and standard deviant value are 75807.12, 73500.00, 108100.0, 45.60, 20646.39 respectively. PRICEBRENT varieble's mean value, median value, maximum value, minimum value and standard deviant value are 93.10039, 92.89500, 126.1650, 48.52000, 20.09047 respectively. PRICEINTEREST varieble's mean value, median value, maximum value, minimum value and standard deviant value are 9.076910, 8.890000, 13.82000, 6.860000, 1.291529 respectively.

PRICEUSD varieble's mean value, median value, maximum value, minimum value and standard deviant value are 1.621118, 1.567000, 1.916000, 1.395000, 0.139338 respectively. According to these figures, PRICEAU and PRICEBRENT variables are the most sensitive variables to price fluctuations. PRICEINTEREST and PRICEUSD variables however give less reaction to price fluctuations.

Table 2: Pricexusin

Included observations: 903 after adjustments				
White heteroskedasticity-consistent standard errors & covariance				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
PRICEAU	0.145550	0.015780	9.223748	0.0000
PRICEBRENT	238.6319	11.64948	20.48433	0.0000
PRICEINTEREST	-2765.559	80.80306	-34.22592	0.0000
PRICEUSD	-2869.817	1300.231	-2.207160	0.0276
C	42598.98	1607.073	26.50719	0.0000
R-squared	0.893411			
Adjusted R-squared	0.892936			
Durbin-Watson stat	1.678786			
Prob(F-statistic)	0.000000			

Table-2 shows the functional relationship between industry sector (PRICEXUSIN) and macro-economic variables. Accordingly, there is a significant relationship between industry sector (PRICEXUSIN) and gold prices (PRICEAU), Oil Prices (PRICEBRENT), Interest Rates (PRICEINTEREST) and American Dollar (PRICEUSD). The direction of this relationship is the same direction with Gold Prices and Oil Prices while it is the opposite direction with Interest Rates and American Dollar. In other words, increase in Gold and Oil prices does not affect rise in Industry Sector.

The reason of this fact is that industry sector reflects the whole increase in oil prices and even more to its prices. In other words, increase in oil prices, which is an important input and therefore an important cost item of industry sector, leads to price increase in the final products of industry sector. In other words, for the price elasticity of final product demand of industry sector is very low (for the price elasticity of demand is of a solid nature), increases in costs can be reflected to prices and the whole increase in costs is undertaken by the consumers. On the other hand, rise in Interest Rates and American Dollar is perceived negatively by industry sector and causes decline. The reason why rise in American Dollar is perceived negatively by industry sector is that rise in dollar causes an increase in costs while the revenue of industry sector, which sells its products in Turkish Lira in the home country, is negatively affected by this situation. In other words, rises in dollar both cause an increase in costs and a decrease in revenues.

Table 3: Pricexulas

Included observations: 903 after adjustments				
White heteroskedasticity-consistent standard errors & covariance				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
PRICEAU	0.100760	0.018652	5.402011	0.0000
PRICEBRENT	4.296238	13.12131	0.327424	0.0434
PRICEINTEREST	-4452.538	101.7361	-43.76554	0.0000
PRICEUSD	-27213.90	1420.021	-19.16443	0.0000
C	106730.4	1975.089	54.03825	0.0000
R-squared	0.757245			
Adjusted R-squared	0.756164			
Durbin-Watson stat	1.548026			
Prob(F-statistic)	0.000000			

Table-3 shows the functional relationship between Transportation Sector (PRICEXULAS) and macro-economic variables. Accordingly, there is a significant relationship between Transportation Sector (PRICEXULAS) and gold prices (PRICEAU), Oil Prices (PRICEBRENT), Interest Rates (PRICEINTEREST) and American Dollar (PRICEUSD). The direction of this relationship is the same direction with Gold Prices and Oil Prices while it is the opposite direction with Interest Rates and

American Dollar. In other words, increase in Gold and Oil prices does not affect rise in Transportation Sector.

In other words, for the price elasticity of final product demand of transportation sector is very low, it can reflect increases in costs and even more to its prices. On the other hand, rise in Interest Rates and American Dollar is perceived negatively by transportation sector and causes decline. In other words, American Dollar rises in borrowing cost- in interest rates and input costs- decrease the revenue and profit of transportation sector.

Table 4: Pricexuhiz

Included observations: 903 after adjustments				
White heteroskedasticity-consistent standard errors & covariance				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
PRICEAU	0.048153	0.009457	5.091863	0.0000
PRICEBRENT	86.56231	7.655720	11.30688	0.0000
PRICEINTEREST	-2452.404	57.35877	-42.75552	0.0000
PRICEUSD	-3143.211	878.8253	-3.576605	0.0004
C	52721.69	1109.532	47.51707	0.0000
R-squared	0.811510			
Adjusted R-squared	0.810670			
Durbin-Watson stat	1.663473			
Prob(F-statistic)	0.000000			

Table-4 shows the functional relationship between Service Sector (PRICEXUHIZ) and macro-economic variables. Accordingly, there is a significant relationship between Service Sector (PRICEXUSIN) and gold prices (PRICEAU), Oil Prices (PRICEBRENT), Interest Rates (PRICEINTEREST) and American Dollar (PRICEUSD). The direction of this relationship is the same direction with Gold Prices and Oil Prices while it is the opposite direction with Interest Rates and American Dollar. In other words, increase in Gold and Oil prices does not affect rise in Service Sector. In other words, for the price elasticity of final product demand of service sector is very low, cost increases are compensated with higher increases in prices. On the other hand, rise in Interest Rates and American Dollar is perceived negatively by Service Sector and causes decline. Because these cost increases can not be reflected to the prices and cause the revenues and profits of firms in this sector to decrease.

Table 5: Pricexfood

Included observations: 903 after adjustments				
White heteroskedasticity-consistent standard errors & covariance				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
PRICEAU	0.320963	0.039716	8.081480	0.0000
PRICEBRENT	261.1246	27.22703	9.590639	0.0000
PRICEINTEREST	-5252.088	175.0187	-30.00872	0.0000
PRICEUSD	27499.91	2935.087	9.369370	0.0000
C	31547.79	3708.985	8.505772	0.0000
R-squared	0.884036			
Adjusted R-squared	0.883519			
Durbin-Watson stat	1.873841			
Prob(F-statistic)	0.000000			

Table-5 shows the functional relationship between Food Sector (PRICEXFOOD) and macro-economic variables. Accordingly, there is a significant relationship between Service Sector (PRICEXUSIN) and gold prices (PRICEAU), Oil Prices (PRICEBRENT), Interest Rates (PRICEINTEREST) and American Dollar (PRICEUSD). The direction of this relationship is the same direction with Gold Prices, Oil Prices and American Dollar while it is the opposite direction with

Interest Rates. In other words, increase in Gold prices, Oil prices and American Dollar does not affect rise in Food Sector. In other words, increases in input costs are compensated by increasing product prices by the firms in this sector. The point which draws attention here is that an increase in American Dollar does not affect food sector. The reason of it can be that the share of imported input is low in food sector. On the other hand, rise in Interest Rates is perceived negatively by Food Sector and causes decline.

6. Results

In this study, the effects of changing energy prices on sectors such as industry, transportation, service and food sectors were examined. For they are one of the most important item of energy inputs, oil prices were taken as energy price index in this study. In addition to this, the effects of changes in indicators like gold prices, USA dollar exchange rate and interest rates on these sectors were included in this analysis.

According to the results of this study, increases in energy prices cause share earnings of industry, transportation, service and food sector to increase. In other words, energy prices form an important input item for these sectors. These sectors can reflect increases in energy prices to their product prices and it causes the revenues of firms in these sectors to increase. The reason of this is considered to be that the price elasticity of demand in these sectors of low level. In this study, however, indicators such as market structures, price elasticity of demand, import input ratio were disregarded for these indicators go beyond the purpose and scope of this study.

On the other hand, when the effects of changes in gold prices on these sectors are examined, it is seen that rises in gold prices increase share earnings of all firms in these sectors. Rises in interest rates however create a negative effect on all sectors and cause share earnings of firms in these sectors to decrease. Finally, rises in USA dollar exchange rate affect food sector in a positive way while these rises cause share earnings of firms in other sectors to decrease.

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