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Sallahuddin Hassan, Nor'Aznin Abu Bakar  
and Hussin Abdullah

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Countries: A Panel Cointegration Approach

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An Estimation of the Consumption Function Under  
the Permanent Income Hypothesis: The Case of D-  
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## EDITORIAL NOTE

Seven papers make up this issue. The first one, titled **Analysis of FDI Inflows into China from ASEAN-5 Countries: A Panel Cointegration Approach** by Sallahuddin Hassan, Nor'Aznin Abu Bakar and Hussin Abdullah, analyses the foreign direct investment (FDI) inflows into China from ASEAN-5 countries using the panel cointegration approach. The FDI model has been utilized in determining factors that influence FDI inflows into China from ASEAN-5 countries, namely, Malaysia, Thailand, the Philippines, Indonesia and Singapore. Variables such as trade openness (OPENNESS), exchange rate of China relative to each of individual ASEAN-5 countries (RELEXC), fixed capital formation (FCF), and gross domestic product (GDP) are used for the period of 1990 – 2004. The empirical results indicate that for most countries OPENNESS and GDP are significant variables in explaining the flow of FDI to China. Meanwhile, FCF is only significant for Malaysia. Conversely, RELEXC is not statistically significant for all countries. It is hoped that this finding can be used by researchers and policy makers in making decision on multilateral relationship between China and ASEAN-5 countries.

The second paper, titled **An Estimation of The Consumption Function Under The Permanent Income Hypothesis: The Case of D-8 Countries** by Ömer Faruk Altunç and Celil Aydın, examines the consumption function formed on the permanent income hypothesis. It covers eight countries that are member to the Organization of Islamic Cooperation (D-8) based on the annual data from 1980 to 2010. The model employed in this study takes into consideration both the adaptive expectations model and a combination of the partial adjustment model and the adaptive expectations model. The techniques used in time series analysis have been utilized as econometric models. Empirical results include evidences supporting the consumption function formed in accordance with the permanent income hypothesis and the adaptive expectations model.

The third paper, titled **Fiscal and Monetary Regime Identification for Price Stability in Case of Pakistan's Economy** by Umaina Arif and Attiya Y. Javid, investigates the relative importance of fiscal and monetary determinants of inflation for Pakistan during 1960-2011. By analyzing the impulse response functions, the relationship linking liabilities to GDP with

surpluses to GDP, verify monetary regime. The study finds that the incident of wealth effects of adjustment in nominal public debt may pass through to prices by escalating inflation variability as predicted by the fiscal theory of price determination. The results do not support the perception that monetary authorities acted consistently with monetary dominant regime in Pakistani case to accommodate the fiscal shocks. A positive shock in inflation leads to the negative response of reserve money growth which is consistent with monetary dominant regime. However discount rate that responds negatively to inflation shock is in line with fiscal dominant regime. The different set of analysis leads to implication that nominal public liabilities, as revealing either in money growth or in nominal public debt, influence price stability in case of Pakistan. The authorities may be following different regimes for different time periods during the 1960-2011.

The fourth paper, titled **Testing the Theoretical Proposition of Exchange Market Pressure: The Nigerian Experience** by Jimoh Olajide Raji, Juzhar Jusoh and Mohd-Dan Jantan, inspects the monetary model of Exchange Market Pressure (EMP) that applied to Nigerian economy over the period 1970 to 2010. In support of the EMP propositions, dynamic ordinary least squares (DOLS) results reveal that domestic credit has stable significant negative relationship with exchange market pressure. The findings also provide evidence that Nigerian monetary authorities absorbed most of the exchange market pressure by adjusting the foreign reserves. The overall results indicate that the Nigeria's experience provides another good example to test the theoretical propositions of the Girton-Roper monetary model of exchange market pressure.

The fifth paper, titled **Poverty Alleviation and Identifying the Barriers to the Rural Poor Participation in MFIs: A Case Study in Bangladesh** by Mohammad A. Ashraf and Yusnidah B. Ibrahim, identifies the barriers of participation of the rural poor in microfinance institutions (MFIs) in Bangladesh. To this aim, data were collected through face to face interview from six different districts of Bangladesh. From the microfinance literature, the study sets eight explanatory factors and six demographics which are explored through three separate models in examining the factors that influence the dependent variables such as nonparticipation and drop-out (Model 1), participation (Model 2) and nonparticipant but willing to participate (Model 3) in MFIs. Logistic regression techniques are employed in analyzing data. The results of Model 1 indicate that education, other assets and spousal dislike to female head of households are observed as the

significant barriers of participation. The outcome of the Model 2 suggests that there have been six factors that inhibit the rural poor participation in MFIs which are gender, age, yearly income, land, religion and lack of knowledge. And in the Model 3, gender, education, land, insufficient resources and lack of knowledge appear to be the significant barriers to participation of the rural poor in MFIs in Bangladesh.

The sixth paper, titled **The Efficiency of Zakat Collection and Distribution: Evidence from Two Stage Analysis** by Ismail Hj Ahmad and Masturah Ma'in, analyzes the efficiency of zakat management of Lembaga Zakat Selangor. The Annual Report data for Lembaga Zakat Selangor between 2001 and 2011 were devised. This paper utilizes the two stage linked Data Envelopment Analysis model, as proposed by Berber et al (2011). The findings show that: first, both collection and distribution have lagging resources that is referred to technical efficiency. Second, the result shows a lower efficiency in distribution than in collection function. Third, from the overall efficiency, allocative and cost efficiency scores show maximum efficiency is achieved almost every year. It reveals that Lembaga Zakat Selangor is utilizing its input proportionately to ensure minimum cost incurred to produce a given output (amount collected and amount distributed) at a given input prices (cost collection and cost distribution)

The last and seventh paper titled **The Causality between Financial Development and Economic Growth: The Case of Turkey** by Ayşen Araç and Süleyman Kutalmış Özcan, investigates the causal relationship between financial development and economic growth in Turkey for the 1987:1-2012:4 period. Eight series are used to indicate financial development and Johansen's (1991) Cointegration Approach, Pesaran's (2001) Bounds Testing and Granger Causality Tests are employed. The test results suggest that long-run relationships exist between economic growth and all financial development indicators. Moreover, the findings support both supply leading and demand following hypotheses. The direction of the short-run and long-run causal relationship between economic growth and financial development depends on which financial development indicator is used. Particularly, improvements in financial development indicators related to the resource allocation function of the financial system lead to economic growth whereas economic growth causes financial development through increasing banks' assets in the long run.



## **Analysis of FDI Inflows into China from ASEAN-5 Countries: A Panel Cointegration Approach**

Sallahuddin Hassan<sup>1</sup>, Nor'Aznin Abu Bakar<sup>2</sup> and Hussin Abdullah<sup>3</sup>

This study analyses the foreign direct investment (*FDI*) inflows into China from ASEAN-5 countries using the panel cointegration approach. The *FDI* model has been utilized in determining factors that influence *FDI* inflows into China from ASEAN-5 countries, namely, Malaysia, Thailand, the Philippines, Indonesia and Singapore. Variables such as trade openness (*OPENNESS*), exchange rate of China relative to each of individual ASEAN-5 countries (*RELEXC*), fixed capital formation (*FCF*), and gross domestic product (*GDP*) are used for the period of 1990 – 2004. The empirical results indicate that for most countries *OPENNESS* and *GDP* are significant variables in explaining the flow of *FDI* to China. Meanwhile, *FCF* is only significant for Malaysia. Conversely, *RELEXC* is not statistically significant for all countries. It is hoped that this finding can be used by researchers and policy makers in making decision on multilateral relationship between China and ASEAN-5 countries.

### **1. Introduction**

Foreign direct investment (*FDI*) plays an important role in the growth and development of not only the developed countries but also in the developing countries. Besides the capital that it brought in, it also introduces new and modern technology which provides market opportunities and linkages to export. Countries are competing with each other to offer a lucrative incentive plans to attract *FDI*.

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The Asian region has always been considered as a prudent centre for investment especially from the United States of America (USA), Japan, United Kingdom (UK) and other European countries. Globalization and integration of economic activities across the world forced the government of the Asian countries to attract *FDI* which later on translated into rapid growth in these economies. Asian countries are implementing new plans and policies to attract more and more *FDI* which will bring in new innovation and automation based technologies that can rejuvenate the host country's existing manufacturing base. Furthermore, the Asian region attracts *FDI* inflows as a result of her abundant natural resources, highly skilled, experienced and knowledge-versed labour, and huge size of domestic market.

China has been opening up its economy for more than twenty years; however its accession to World Trade Organization (WTO) on 11 December 2001 implies extensive consequences for its economy. China's opening up policy has aimed at promoting exports, while protecting the domestic market. This was achieved through a dualistic trade regime, which has granted tariff exemptions on imports of intermediate goods by export-oriented industries, and through a selective policy, which has channelled *FDI* into manufacturing production targeted for exports or for import substitution. As a result, *FDI* inflows have played a major part in the opening up of China's industry and its integration into the international division of labour. The rapid expansion of its international trade and large capital inflows provide evidence of the increasing integration of China in the world economy. Since 1980, China's share in international trade has trebled, rising from less than one percent to more than three percent in 1999. During the first 6 months of 2012, China has surpassed the USA as the world's largest recipient of global *FDI* with a total of USD59 billion compared to *FDI* flowing to the USA totalling USD57.4 billion

The cooperation and partnership between China and ASEAN has long been established through various channels for attaining certain goals. One of the major channels is *FDI* inflows. According to Shu and Zeng (2006), *FDI* inflows from ASEAN-5 into China in 2004 was about fifty times as much as it was in 1990 (see Table 1). During 1994 – 2004, the cumulative amount of China's actually utilized *FDI* from ASEAN-5 reached USD33.73 billion, which exceeded the cumulative amount of China's actually utilized *FDI* from the UK, France and Germany

combined, which was USD27.21 billion. Based on country, Singapore recorded the highest amount of *FDI* inflows to China and then followed by Malaysia. This fact is in line with the argument by Ellingsen *et al.* (2006) that Singapore is one of the most important outward investors in the developed countries. Singaporean direct investors were strongly encouraged by the government to reach beyond ASEAN and were increasingly shifting their attention to other Asian host countries, particularly China. Furthermore, the growth of *FDI* inflows from ASEAN-5 into China increased tremendously in 1992 and 1993, but showed a declining trend after the year 1994. The worst *FDI* growth recorded in 1999 that due to East Asian financial crisis in the middle of 1997. This largely unforeseen crisis and its aftermath caused deterioration in the macroeconomic fundamentals, particularly slower economic growth of Thailand, Malaysia and Indonesia. As a result, these countries reduced their *FDI* inflows into China. This gives rise to the issues of whether the ASEAN-5 countries are able to maintain investment in China and the emerging factors that significantly affect the ability of ASEAN-5 countries invest in China.

**Table 1:** Foreign Direct Investment in China by ASEAN-5 Countries, 1990 – 2004 (Amount contracted in USD million)

| Year | Country  |           |           |          |                    | ASEAN<br>-5 | Growth<br>(%) |
|------|----------|-----------|-----------|----------|--------------------|-------------|---------------|
|      | Malaysia | Indonesia | Singapore | Thailand | The<br>Philippines |             |               |
| 1990 | 64       | 100       | 5043      | 672      | 167                | 6046        |               |
| 1991 | 196      | 218       | 5821      | 1962     | 585                | 8782        | 45.25         |
| 1992 | 2467     | 2017      | 12593     | 8432     | 1655               | 28390       | 223.27        |
| 1993 | 9142     | 6575      | 49180     | 23437    | 12250              | 102385      | 260.64        |
| 1994 | 20099    | 11570     | 11791     | 23487    | 14040              | 189300      | 84.89         |
| 1995 | 25900    | 11163     | 186061    | 28824    | 10578              | 265356      | 40.18         |
| 1996 | 45995    | 9354      | 224716    | 32818    | 5551               | 319396      | 20.37         |
| 1997 | 38183    | 7998      | 260641    | 19400    | 15563              | 342800      | 7.33          |
| 1998 | 34049    | 6879      | 340397    | 20538    | 17927              | 422318      | 23.20         |
| 1999 | 23771    | 12917     | 264249    | 14832    | 11728              | 328877      | -22.13        |
| 2000 | 20288    | 14694     | 217220    | 20357    | 11112              | 284458      | -13.51        |
| 2001 | 26298    | 15964     | 214355    | 19421    | 20939              | 298395      | 4.90          |
| 2002 | 36786    | 12164     | 233720    | 18772    | 18600              | 325594      | 9.12          |
| 2003 | 25103    | 15013     | 205840    | 17352    | 22001              | 292543      | -10.15        |
| 2004 | 38504    | 10452     | 200814    | 17828    | 23324              | 304053      | 3.93          |

Sources: Shu and Zeng (2006).

Given the above scenario, we are encouraged to undertake further analysis to identify factors that significantly affect the *FDI* inflows into China from the selected ASEAN–5 countries. In this article, we postulate that China’s macroeconomic fundamentals can influence *FDI* inflows from the ASEAN–5 countries.

Furthermore, this study is also motivated by the fact that there has been little econometric modeling and evidences of how the macro fundamentals of China affect the inflows of capital from the ASEAN–5 countries. This paper tries to fill this gap by analyzing the link between China and the ASEAN–5 countries through *FDI* inflows activities. This link has never been addressed aggressively in the literature particularly after WTO accession protocol. Therefore, this study aims to provide new evidence of macro-determinants of *FDI* inflows between China and ASEAN–5. Since China has become very important in the world economic operation and an attractive site for *FDI* (Naughton, 1996) after admission in WTO, ASEAN–5 countries would gain some significant benefits through *FDI* activities in China.

The paper is organized as follows. Section 2 reviews the existing literature on determinants of *FDI* inflows. Section 3 describes the data used and the methodology of determining factors that influence the level of *FDI* inflows into China. The empirical results of the study are reported in Section 4 and Section 5 presents the conclusion.

## **2. Literature Review**

Many studies have been carried out to analyze the determinants of *FDI* and its effect to host countries, particularly developing countries. As stated in many studies, *FDI* plays an important role in these economies which are generally lacking in terms of technology as well as capital to fund the projects (Borenzstein *et al.*, 1998; Estrin *et al.*, 2000; Buckley *et al.*, 2001). In addition, Calvo *et al.* (1996) and Moreno (2000) stated that capital flows from one country to another also allow investors to diversify their risks.

As the time progress and because of many factors, the trend of *FDI* inflows is not just from developed countries to developing or under developing countries, but the reverse or outward *FDI* may exist. This phenomenon also happens among ASEAN–5 countries. Even though,

these countries are considered as developing countries, they intend to invest in abroad in order to grab the opportunities and advantageous offered by the recipient countries.

One of the specific studies related to *FDI* inflows in China and ASEAN has done by Shu and Zeng (2006). Their descriptive analyses have indicated three factors that exert significant influence on *FDI* inflows between China and ASEAN. These factors are new bilateral economic agreements, China's new mega economic zone, and ASEAN reforms and new foreign policy. Bilateral agreements such as Framework Agreement on Comprehensive Economic Cooperation (FACEC) between ASEAN and People's Republic of China signed in 2002, for instance, can strengthen economic relations, which is a strategic goal of both sides. A large variety of Chinese products have been exported, on a large scale, into ASEAN member countries. Following the FACEC agreement, China provides survival and growth opportunities for ASEAN investors and traders.

There are many emerging microeconomic and macroeconomic fundamentals that influence a country to invest abroad or to receive *FDI* inflows from abroad. However, this brief review gives more emphasize to the effects of macroeconomic fundamentals on *FDI* inflows. In addition to geographic location, the important macroeconomic fundamentals of host/recipient countries such as gross domestic product (*GDP*), exchange rates, trade openness, and capital accumulation are considered as important determinants.

Openness of one location is one of the traditional variables to explain *FDI* movements. It is defined as the ratio of total trade (export plus import) to *GDP*. MNEs engaged in export oriented investment prefer to locate in a more open economy as increased imperfections that accompany trade protection generally imply higher transaction costs associated with exporting. A study done by the Organization for Economic Cooperation and Development (2000) find that trade openness is one of the main determinants of *FDI* in China. China has adopted the 'export promotion strategy' where it has implemented economic reforms and open-door policies, at the same time it also promotes trade by concluding several bilateral trade arrangements. This can be seen in 1990s where there has been a substantial progress in reducing tariff barriers, i.e. the average tariff rate on imports declined

from 42.9 percent in 1992 to 17.6 percent in 1997. With regard to this variable, the expected impact of the degree of openness on *FDI* can be mixed; it can attract the foreign capital to the host area and also can increase competition between the foreign and domestic firms on it. Meanwhile, Acemoglu and Zilibotti (1997) explain that greater openness in international transactions helps direct financial flows from capital-abundant towards capital-scarce countries. Adhikary (2011) has claimed that the degree of trade openness is likely to influence the flows of international capital in terms of risk-return relationship.

Exchange rate has greater impact on the flow of foreign capital into host country [see Froot and Jeremy (1991), Pain and Van Welsun (2003), Philips *et al.* (2008), Gottschalk *et al.* (2008), Baek and Okawa (2001), Nyarko and Nketiah-Amponsah (2011), Chaudary *et al.* (2012), Ullah *et al.* (2012), and Ngowani (2012)]. Chaudary *et al.* (2012), for instance, have studied the effects of exchange rate on *FDI* in the Asian economies; with Pakistan, India, Sri Lanka, and Bangladesh representing South Asian. Malaysia, Indonesia, Singapore and Thailand representing the Southeast Asian region; China, Japan and South Korea representing the country in East Asia. While Turkey, Iran, and Israel representing West Asia. They have used Autoregressive Distributed Lag (ARDL), cointegration and error correction model (ECM) for performing empirical analysis. They found that more than half of the selected countries show no significant relationship between *FDI* and exchange rate. Effect of short-term and long-term exists in Pakistan, India, Sri Lanka, South Korea, Turkey and Israel. The results indicated there was no relationship between *FDI* and exchange rates for Bangladesh, China, Malaysia, Indonesia, Thailand, Singapore, and Iran.

Furthermore, economic growth of the host country is another main determinant of *FDI* inflows. This variable is used in many studies such as Toda and Yamamoto (1995), Wang and Swain (1995), Zhang (1999, 2000, 2002), Barthelemy and Demurger (2000), Wei and Liu (2001), Jordan (2002), Ali and Guo (2005), and Le and Liu (2005). They agreed that one of the main factors is the growth of the host country which can be measured by the *GDP*, *GDP* per capita, gross national product (*GNP*), and *GNP* per capita. Thus, the variable *GDP* is expected to have a positive significant relationship with *FDI* inflows. Borensztein *et al.* (1998), for instance, have argued that *FDI* inflows are positively related

to per capita *GDP* growth provided the host country has a highly educated workforce. Meanwhile, Chowdhury and Mavrotas (2003) find unidirectional causality running from growth to *FDI* in the case of Chile but find bidirectional causality for Thailand and Malaysia.

The earlier growth models by Harrod (1939) and Domar (1946) explained that capital formation raises the standard of living, which in turn results in higher growth. Then, Solow (1956) argues that capital formation increases labor productivity in a dynamic process of investment growth and finally enhancing economic growth. These evidences recognize the role of capital formation in economic growth and then create a basis for attracting *FDI* inflows into a particular country. Analytically, capital formation can improve domestic investment through positive spillovers and by creating complementary industries. Thus, capital formation has a dynamic effect on *FDI* inflows. This is supported by Adhikary (2011) where he mentioned that the level of capital formation is likely to influence *FDI* and economic growth. Neo-classical growth model postulates that developing economies that have a lower initial level of capital stock tend to have higher marginal rate of returns (productivity) and growth rates if adequate capital stock is injected. In other words, in a capital shortage economy, the marginal productivity of investment is increased in the short-run when additional capital is injected in the form of long-term investment like *FDI*, and this increased productivity influences economic growth in the long-run.

At the macro level, by and large, previous literature suggests that macroeconomic determinants contribute to *FDI* inflows through either direct or indirect *FDI*. Direct *FDI* is a type of investment where investment activities are carried out by the foreign-owned firm such as parent (headquarter) directly. Meanwhile, indirect *FDI* is a type of *FDI* by foreign affiliate. Investment activities are carried out by firm, which themselves are affiliates of foreign Multinational Enterprises (MNEs) such as a regional headquarter.

### 3. Methodology

#### 3.1 Data

Secondary data are used in the study. Due to short time spans of time series data, we have pooled cross-section and time series data to form a balanced panel data. Using the short time span of time series data may yield unreliable results. The balanced panel consists of annual data for *FDI* inflows into China from five selected ASEAN-5 countries, namely Malaysia, Thailand, The Philippines, Indonesia and Singapore for the period of 1990 – 2004 and data of each variable is measured in US dollars. The use of panel data allows us to study both the changes in the independent variables of a single ASEAN-5 country over time and the variation in these variables of many ASEAN-5 countries at a given point in time. The data are gathered and verified from various sources i.e. International Financial Statistics by International Monetary Fund (IMF), Direction of Trade Statistics, World Development Indicators and World Debt Tables.

#### 3.2 Model Specification

Based on previous literature, *FDI* inflows are mainly determined by trade openness (*OPENESS*), exchange rate (*RELEXC*), fixed capital formation (*FCF*), and *GDP*. It is described by the basic function as Equation [1]. Furthermore, the empirical model form for this function is given by Equation [2].

$$FDI = f(OPENESS, RELEXC, FCF, GDP) \quad [1]$$

$$FDI_{it} = \beta_0 + \beta_1 OPENESS_{it} + \beta_2 RELEXC_{it} + \beta_3 FCF_{it} + \beta_4 GDP_{it} + \varepsilon_{it} \quad [2]$$

In Equation [2], *FDI* represents the total *FDI* inflows into China from ASEAN-5 countries, *OPENESS* represents the level of trade openness and it is measured by the trade-intensity ratio, which is the share of export and import in *GDP*, *RELEXC* is the exchange rate of China relative to each of the individual ASEAN-5 countries, *FCF* is the total of fixed capital formation in China, and *GDP* is the gross domestic product of China. The choice of these variables relies on the data accessibility and the value of data in dollar America. The  $\beta_0$  is a

constant term and  $\beta_1$  to  $\beta_4$  are estimated parameters in the model and  $i$  is a cross-section data for countries referred to, and  $t$  is a time series data and  $\varepsilon_{it}$  is an error term. Both the coefficients,  $\beta_3$  and  $\beta_4$ , are expected to carry a positive sign.

### 3.3 Estimation Procedure

Estimation procedure of the relationship between *FDI* inflows into China and independent variables in Equation [2] involves two main steps, cointegration analysis and coefficient estimation.

#### 3.3.1 Cointegration Analysis

We have employed panel cointegration approach to perform cointegration analysis. This method is used to investigate the existence of the long run cointegration among the variables. In order to investigate the possibility of panel cointegration, it is first necessary to determine the existence of unit roots in the data series. For this study, we have chosen the Im, Pesaran and Shin (IPS, hereafter) (1997), which is based on the well-known Dickey–Fuller procedure. IPS proposed a test for the presence of unit roots in panels that combines information from the time series dimension with that from the cross section dimension, such that fewer time observations are required for the test to have power. The use of this method is motivated by that this is commonly used and superior test power (Chou and Lee, 2003). Many economic researchers such as Lee *et al.* (1997), Sarantis and Steward (1999), Canzoneri *et al.* (1999), and Chou and Lee (2003) have also applied this method in their analysis of the long-run relationships in panel data.

IPS begins by specifying a separate ADF regression for each cross-section with individual effects and no time trend:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{it} \quad [3]$$

where  $i = 1, \dots, N$  and  $t = 1, \dots, T$

IPS use separate unit root tests for the  $N$  cross-section units. Their test is based on the Augmented Dickey – Fuller (ADF) statistics averaged across groups. After estimating the separate ADF regressions, the

average of the  $t$  – statistics for  $p_i$  from the individual ADF regressions,  $t_{iT_i}(p_i)$ :

$$\bar{t}_{NT} = \frac{1}{N} \sum_{i=1}^N t_{iT}(p_i \beta_i) \quad [4]$$

The  $t$  – bar ( $\bar{t}$ ) is then standardized and it is shown that the standardized  $\bar{t}$  statistic converges to the standard normal distribution as  $N$  and  $T \rightarrow \infty$ . IPS (1997) showed that  $\bar{t}$  test has better performance when  $N$  and  $T$  are small. They proposed a cross-sectionally demeaned version of both test to be used in the case where the errors in different regressions contain a common time-specific component.

The next step is to test for the existence of a long-run cointegration between  $FDI$  and the independent variables using panel cointegration tests suggested by Pedroni (1999, 2004). Pedroni (1999) determined that the tests are appropriate to estimate residuals from a cointegration regression after normalizing the panel statistics with correction terms. The test procedures proposed by Pedroni make use of estimated residual from the hypothesized long-run regression of the following form:

$$y_{i,t} = \alpha_i + \delta_i t + \beta_{1i,t} x_{1i,t} + \beta_{2i,t} x_{2i,t} + \dots + \beta_{Mi,t} x_{Mi,t} + e_{i,t} \quad [5]$$

for  $t = 1, \dots, T$ ;  $i = 1, \dots, N$ ;  $m = 1, \dots, M$ ,

where  $T$  is the number of observations over time,  $N$  number of cross-sectional units in the panel, and  $M$  number of regressors. In this set up,  $\alpha_i$  is the member specific intercept or fixed effects parameter which varies across individual cross-sectional units. The same is true of the slope coefficients and member specific time effects,  $\delta_i t$ .

Pedroni (1999, 2004) proposes the heterogeneous panel and heterogeneous group mean panel test statistics to test for panel cointegration. He defines two sets of statistics. The first set of three statistics  $Z_{\hat{v},N,T}$ ,  $Z_{\hat{\beta},N,T-1}$  and  $Z_{tN,T}$  is based on pooling the residuals along the within dimension of the panel. The statistics are as follows

$$Z_{\hat{v},N,T} = T^2 N^{3/2} \left( \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1it}^2 \hat{e}_{i,t-1}^2 \right) \quad [6]$$

$$Z_{\hat{\rho}_{N,T-1}} = T\sqrt{N} \left( \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^2 \hat{e}_{i,t-1}^2 \right)^{1/2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^2 (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} \hat{\lambda}_i) \quad [7]$$

$$Z_{tN,T} = \left( \tilde{\sigma}_{N,T}^2 \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^2 \hat{e}_{i,t-1}^2 \right)^{1/2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^2 \hat{e}_{i,t-1}^2 (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} \hat{\lambda}_i) \quad [8]$$

where  $\hat{e}_{i,t-1}$  is the residual vector of the OLS estimation of Equation [5] and where the other terms are properly defined in Pedroni.

The second set of statistics is based on pooling the residuals along the between dimension of the panel. It allows for a heterogeneous autocorrelation parameter across members. The statistics are as follows:

$$\tilde{Z}_{\hat{\rho}_{N,T-1}} = \sum_{i=1}^N \left( \sum_{t=1}^T \hat{e}_{i,t-1}^2 \right)^{1/2} \sum_{t=1}^T (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} \hat{\lambda}_i) \quad [9]$$

$$\tilde{Z}_{tN,T-1} = \sum_{i=1}^N \left( \sum_{t=1}^T \hat{e}_{i,t-1}^2 \right)^{1/2} \sum_{t=1}^T (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} \hat{\lambda}_i) \quad [10]$$

These statistics compute the group mean of the individual conventional time series statistics. The asymptotic distribution of each of those five statistics can be expressed in the following form:

$$\frac{X_{N,T} - \mu\sqrt{N}}{\sqrt{v}} \Rightarrow N(0,1) \quad [11]$$

where  $X_{N,T}$  is the corresponding from of the test statistics, while  $\mu$  and  $v$  are the mean and variance of each test respectively. They are given in Table 2 in Pedroni (1999). Under the alternative hypothesis, Panel  $v$  statistics diverges to positive infinity. Therefore, it is a one sided test where large positive values reject the null of no cointegration. The remaining statistics diverge to negative infinity, which means that large negative values reject the null.

### 3.3.2 Coefficients Estimation

For coefficient estimation, we have adopted the Fully Modified Ordinary Least Squares (FMOLS) procedure based on Christopoulos and Tsionas (2004). In order to obtain asymptotically efficient consistent estimates in panel series, non-exogeneity and serial correlation problems are tackled by employing FMOLS introduced by Pedroni (1996). Since the explanatory variables are cointegrated with a time trend, and thus a long-run equilibrium relationship exists among these variables through the panel unit root test and panel cointegration test, we proceed to estimate the Equation [2] by the method FMOLS for heterogenous cointegrated panels. This methodology allows consistent and efficient estimation of cointegration vector and also addresses the problem of non-stationary regressors, as well as the problem of simultaneity biases. It is well known that Ordinary Least Squares (OLS) estimation yields biased results because the regressors are endogenously determined in the  $I(1)$  case. The starting point OLS as in the following cointegrated system for panel data:

$$\begin{aligned} y_{it} &= \alpha_i + x'_{it}\beta + e_{it} \\ x_{it} &= x_{i,t-1} + \varepsilon_{it} \end{aligned} \quad [12]$$

where  $\xi_{it} = [e_{it}, \varepsilon'_{it}]$  is the stationary with covariance matrix  $\Omega_i$ . The estimator  $\beta$  will be consistent when the error process  $\omega_{it} + [e_{it}, \varepsilon'_{it}]'$  satisfies the assumption of cointegration between  $y_{it}$  and  $x_{it}$ . The limiting distribution of OLS estimator depends upon nuisance parameters. Following Phillips and Hansen (1990), a semi-parametric correction can be made to the OLS estimator that eliminates the second order bias caused by the fact that the regressors are endogenous. Pedroni (1996, 2000) follows the same principle in the panel data context, and allows for the heterogeneity in the short run dynamics and the fixed effects. FMOLS Pedroni's estimator is constructed as follow:

$$\begin{aligned} \hat{\beta}_{FM} &= \left( \sum_{i=1}^N \hat{\Omega}_{22i}^{-2} \sum_{t=1}^T (x_{it} \hat{x}_t)^2 \right)^{-1} \sum_{i=1}^N \hat{\Omega}_{11i}^{-1} \hat{\Omega}_{22i}^{-1} \left( \sum_{t=1}^T (x_{it} \bar{x}_t) e_{it} T \hat{\gamma}_i \right) \\ \hat{e}_{it} &= e_{it} \hat{\Omega}_{22i}^{-1} \hat{\Omega}_{21i}, \quad \hat{\gamma}_i = \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^0 \hat{\Omega}_{22i}^{-1} \hat{\Omega}_{21i} (\hat{\Gamma}_{22i} + \hat{\Omega}_{22i}^0) \end{aligned} \quad [13]$$

where the covariance matrix can be decomposed as  $\Omega_i = \Omega_i^0 + \Gamma_i + \Gamma_i$  where  $\Omega_i^0$  is the contemporaneous covariance matrix, and  $\Gamma_i$  is a weighted sum of autocovariances. Also,  $\hat{\Omega}_i^0$  denotes an appropriate estimator of  $\Omega_i^0$ .

In this study, we employed panel group FMOLS test from Pedroni (1996, 2000). An important advantage of the panel group estimators is that the form in which the data is pooled allows for greater flexibility in the presence of heterogeneity of the cointegrating vectors. Test statistics constructed from the panel group estimators are designed to test the null hypothesis  $H_0 : \beta_i = \beta_0$  for all  $i$  against the alternative hypothesis  $H_A : \beta_i \neq \beta_0$ , so that the values for  $\beta_i$  are not constrained to be the same under the alternative hypothesis. Clearly, this is an important advantage for applications such as the present one, because there is no reason to believe that, if the cointegrating slopes are not equal to one, which they necessarily take on some other arbitrary common value. Another advantage of the panel group estimators is that the point estimates have a more useful interpretation in the event that the true cointegrating vectors are heterogeneous. Specifically, point estimates for the panel group estimator can be interpreted as the mean value for the cointegrating vectors (Pedroni, 2001).

#### 4. Empirical Results

Table 2 presents the results of the IPS panel unit root test at level indicating that all variables are  $I(1)$  in the constant of the panel unit root regression.

These results clearly show that the null hypothesis of a panel unit root in the level of the series cannot be rejected at various lag lengths. We assume that there is no time trend. Therefore, we test for stationarity allowing for a constant plus time trend. In the absence of a constant plus time trend, again we found that the null hypothesis of having panel unit root is generally rejected in all series at level form and various lag lengths. We can conclude that most of the variables are non-stationary in with and without time trend specifications at level by applying the IPS

test which is also applied for heterogeneous panel to test the series for the presence of a unit root.

**Table 2:** Panel Unit Root Test – Im, Pesaran and Shin (IPS)

| Variable       | Level             |                   | First Order Difference |                      |
|----------------|-------------------|-------------------|------------------------|----------------------|
|                | Constant          | Constant + Trend  | Constant               | Constant + Trend     |
| <i>FDI</i>     | -1.261<br>(0.104) | -1.043<br>(0.148) | -2.707**<br>(0.003)    | -1.703**<br>(0.044)  |
| <i>OPENESS</i> | -0.918<br>(0.913) | -1.682<br>(0.871) | -3.411*<br>(0.000)     | -3.506**<br>(0.001)  |
| <i>RELEXC</i>  | -1.418<br>(0.586) | -1.772<br>(0.821) | -3.183*<br>(0.000)     | -3.313**<br>(0.005)  |
| <i>FCF</i>     | -2.044<br>(0.899) | -1.620<br>(0.899) | -2.451**<br>(0.017)    | -1.549***<br>(0.061) |
| <i>GDP</i>     | -2.010<br>(0.127) | -1.963<br>(0.683) | -2.977*<br>(0.001)     | -2.887**<br>(0.051)  |

Note: \* and \*\* indicate rejection of the null hypothesis of no cointegration at one percent and five percent levels of significance

The results of the panel unit root tests confirm that the variables are non-stationary at level. Table 2 also presents the results of the tests at first difference for IPS test in constant and constant plus time trend. We can see that for all series the null hypothesis of unit root test is rejected at both one percent and five percent levels of significance. Hence, based on IPS test, there strong evidence that all the series are in fact integrated of orders one.

We can conclude that the results of panel unit root test (IPS test) reported in Table 2 support the hypothesis of a unit root in all variables across countries, as well as the hypothesis of zero order integration in first differences. At most of one percent significance level, we found that all tests statistics in both with and without trends significantly confirm that all series strongly reject the unit root null. Given the result of IPS test, it is possible to apply panel cointegration method in order to test for the existence of the stable long-run relation among the variables.

The next step is to test whether the variables are cointegrated using Pedroni's (1999, 2001, 2004). This is to investigate whether long-run steady state or cointegration exist among the variables and to confirm what Coiteux and Olivier (2000) state that the panel cointegration tests

have much higher testing power than conventional cointegration test. Since the variables are found to be integrated in the same order  $I(1)$ , we continue with the panel cointegration tests proposed by Pedroni (1999, 2001, 2004). Cointegrations are carried out for constant and constant plus time trend and the summary of the results of cointegrations analyses are presented in Table 3.

In constant level, we found that three out of seven statistics reject null by hypothesis of no cointegration at the five percent level of significance for the *adf* – statistic and group  $\rho$  – statistic, while the group – *adf* is significant at one percent level. The results of the panel cointegration tests in the model with constant level show that independent variables do hold cointegration in the long run for a group of ASEAN–5 countries with respect to *FDI*. In the panel cointegration test for our model with constant plus trend level, the results indicate that four out of seven statistics reject the null hypothesis of non cointegration at the one percent and five percent level of significance. It is shown that independent variables do hold cointegration in the long run for a group of ASEAN–5 countries with respect to *FDI*. However, since all the statistics conclude in favour of cointegration, and this, combined with the fact that the according to Pedroni (1999) the panel non–parametric (*t* – statistic) and parametric (*adf* – statistic) statistics are more reliable in constant plus time trend, we conclude that there is a long–run cointegration among our variables in ASEAN–5 countries.

**Table 3:** The Pedroni Panel Cointegration Test

| Test                                               | Constant trend | Constant + Trend |
|----------------------------------------------------|----------------|------------------|
| Panel $v$ – Statistic                              | -0.061         | -0.842           |
| Panel $\rho$ – Statistic                           | -0.988         | -1.836**         |
| Panel $t$ – Statistic: (non–parametric)            | -1.024         | -1.210           |
| Panel $t$ – Statistic ( <i>adf</i> ): (parametric) | -2.198**       | -2.137**         |
| Group $\rho$ – Statistic                           | -1.971**       | -2.654**         |
| Group $t$ – Statistic: (non–parametric)            | -0.619         | -1.295           |
| Group $t$ – Statistic ( <i>adf</i> ): (parametric) | -3.172*        | -3.587*          |

Note: – All statistics are from Pedroni’s procedure (1999) where the adjusted values can be compared to the  $N(0,1)$  distribution. The Pedroni (2004) statistics are one-sided tests with a critical value of  $-1.64$  ( $k < -1.64$  implies rejection of

the null), except the  $v$  – statistic that has a critical value of 1.64 ( $k > 1.64$  suggests rejection of the null).

- \* and \*\* indicate rejection of the null hypothesis of no cointegration at one percent and five percent levels of significance, respectively.

Once we have confirmed that there is a presence of a long run relationship between *FDI* inflows into China and independent variables, we have done coefficients estimation. The results of estimation are shown in Table 4.

**Table 4:** FMOLS Regression Results

| <i>FDI</i> Inflows from | Variables         |                  |                    |                  |
|-------------------------|-------------------|------------------|--------------------|------------------|
|                         | <i>OPENNESS</i>   | <i>RELEXC</i>    | <i>FCF</i>         | <i>GDP</i>       |
| Indonesia               | 5.55*<br>(3.86)   | −0.42<br>(−0.60) | −22.72*<br>(−3.82) | 30.85*<br>(4.17) |
| Malaysia                | 6.33*<br>(2.54)   | 0.52<br>(0.30)   | 2.91**<br>(2.17)   | 1.52<br>(1.01)   |
| Philippines             | 1.58<br>(1.03)    | 0.49<br>(0.27)   | 1.30<br>(0.45)     | 2.22<br>(0.89)   |
| Singapore               | −4.67*<br>(−3.22) | −0.66<br>(−1.10) | 0.37<br>(0.45)     | 3.97*<br>(4.95)  |
| Thailand                | 0.65<br>(0.64)    | −0.46<br>(−0.34) | −2.89**<br>(−2.09) | 5.74**<br>(2.59) |
| Panel Group             | 1.89**<br>(2.17)  | −0.11<br>(−0.66) | −4.21<br>(−1.27)   | 8.86*<br>(6.08)  |

Note: – The null hypothesis for the  $t$  – ratio is  $H_0 : \beta_i = 0$ .

- Figures in parentheses are  $t$  – statistics.
- \* and \*\* indicate rejection of the null hypothesis at one percent and five percent levels of significance, respectively.

As shown by Table 4, the sign of estimated coefficient for *OPENNESS* are correct and statistically significant at one percent level for Indonesia and Malaysia, respectively. One unit increase in trade-intensity ratio caused as much as USD5.5 and USD6.63 of *FDI* inflows into China from Indonesia and Malaysia. Higher degree of openness economy of China means the restriction to trade is low or falling, thus facilitating more international exchange of capital between China and these two countries. For the case of the Philippines and Thailand, even though the estimated coefficients show positive relationships with the value of coefficients are 1.58 and 0.65, respectively but they are not significant. In contrast, *OPENNESS* has negative effect on *FDI* inflows into China

from Singapore since the estimated coefficient is negative and statistically significant. It means that a higher degree of openness implies a lower level of *FDI* inflows. This can be explained by looking at the type of investments made by the countries. If it is horizontal (market-seeking) investments, trade restrictions (means less openness) would have a positive effect on *FDI* inflows. This is due to the ‘tariff jumping’ hypothesis which argues that foreign firms that seek to serve local markets may decide to set up subsidiaries in the host market as it is difficult to import their products to the country. The other way around multinational firms engaging in export-oriented investments will prefer to locate in a more open economy since increased imperfections that accompany trade protection imply higher transaction costs associated with exporting.

Furthermore, all coefficients of *RELEXC* are not statistically significant. Therefore, there is no statistically significant long-run relationship between *RELEXC* and *FDI* inflows into China from ASEAN-5. This finding suggests that the changes in relative exchange rates do not influence significantly *FDI* inflows into China from ASEAN-5, which is contrast to the explanation provided by Xu and Wang (2007). Our result shows that the movement of exchange rates plays no role in explaining the level of *FDI* inflows into China. This can be justified with production flexibility argument (De Meza & van der Ploeg, 1987; Aizenman, 1992; Phillips *et al.* 2008). According to this argument, foreign investors are risk neutral and they commit to domestic and foreign capacity *ex ante*, after the realization of nominal or real shocks. This result is consistent with Bailey and Tavlas (1991) and Goldberg and Kolstad (1995). Goldberg and Kolstad, for instance, argued that if investors are classified as risk neutral, there is no significant relationship between exchange rate volatility and the allocation of production facilities between local and foreign markets.

However, this result is also contrast to the common argument of economic theory and available literature on exchange rates and *FDI* that based on risk-aversion argument, imperfect capital market hypothesis, and irreversible investment decision (Dixit & Pindyck, 1994). Economic theory states that as a depreciated exchange rate lowers the cost of production and higher competitiveness of country. Therefore, investment activities particularly *FDI* inflows into the host countries will increase. Furthermore, risk-aversion argument and imperfect capital

market hypothesis theoretically claim that the level of exchange rate may negatively influence *FDI*. Using imperfect capital market consideration, study of Froot and Stein (1991) provide the evidence of negative relationship between exchange rates and *FDI*. A weaker host country currency, inward *FDI* tends to increase within an imperfect capital market model as depreciation makes host country assets less expensive relative to assets in the home country. Walsh and Yu (2010) have also stated the similar argument. A weaker real exchange rate might be expected to increase vertical *FDI* as firms take advantage of relatively low prices in host markets to purchase facilities or, if production is re-exported, to increase home-country profits on goods sent to a third market. Meanwhile, depends on the expectations of future profitability, Campa (1993) predicted that an appreciation of the host currency will increase *FDI* into the host country. Using data on Japanese acquisitions in the USA, Blonigen (1997) has concluded different argument from Froot and Stein. Other numerical studies by Cushman (1988) and Dewenter (1995) have supported Campa and Blonigen's views.

Interestingly, the positive coefficient of *FCF* and it is statistically significant at five percent level implies that increase USD1 million of *FCF* caused increment of *FDI* inflows into China from Malaysia as much as USD2.91 million. Thus, this finding is in line with the theory that explains countries with high capital formation normally have more access to capital and they tend to become home country and do investment abroad. On the other hand, *FCF* has negative effect on *FDI* inflows from Indonesia and Thailand since its coefficients values are negative and statistically significant at one percent and five percent level. The result supports the argument of Adhikary (2011). He argued that the level of capital formation is likely to influence *FDI* and economic growth as well. Neo-classical growth model postulates that developing economies that have a lower initial level of capital stock tend to have higher marginal rate of returns (productivity) and growth rates if adequate capital stock is injected

As expected, we found that the coefficients of *GDP* are positive and statistically significant at one percent level only. Therefore, these results suggest that *GDP* of China has positive effect on *FDI* inflows from Indonesia, Singapore, and Thailand. The results show that increase USD1 million China's *GDP* will cause increase *FDI* inflows from

Indonesia, Singapore, and Thailand as much as USD30.85 million, USD3.97 million, and USD5.74 million, respectively. We can conclude that the high rate of economic growth in China will lead to increase the inflows of *FDI* inflows from these countries. *FDI* inflows from Indonesia are the largest contribution among them. The result obtained from this variable is also similar to studies done by Tsai (1994) and Schneider and Frey (1985). Both studies indicate that real *GDP* per capita as a proxy of market size has a strong positive relationship with *FDI*. However, it should be noted that while market size is still a significant variable, its importance has been slowly decreasing recently. This result is also echoed by (UNCTAD 1996; 97) which found that *FDI* in developing countries are slowly shifting from resource and market seeking to more (vertical) efficiency seeking.

## 5. Policy Implication and Conclusion

This study examines the determinants of *FDI* inflows into China from ASEAN-5 using the panel cointegration approach. The unit root test (IPS) is used to confirm the stationarity of all variables before performing cointegration test. After confirming that all variables are non-stationary at level, the panel cointegration approach is applied. Using Pedroni's approach, the long-run cointegration test is performed to investigate the existence of the long-run cointegration among the variables. This paper provides statistical evidence that the long-run determinants of *FDI* inflows into China may differ among ASEAN-5 countries. Results obtained indicate the presence of the long-run relationship between *OPENNESS* and *FDI* inflows from Indonesia, Malaysia and Singapore. However, there is no statistically significant long-run cointegration between *RELEXC* and *FDI* inflows from ASEAN-5 countries. For the case of Malaysia, the coefficient of *FCF* is statistically significant with the value of 2.91 and therefore, we can conclude that there is still a long run cointegration between *FCF* and *FDI*.

The results suggest that the macroeconomic policy framework is important. China can indeed usefully undertake policies to foster the volume of *FDI* inflow from the ASEAN-5. In specific, we found that *GDP* and *FCF* are crucial as part of future policy to further attract new *FDI* to inflow to China. The low impact of *GDP* and *FCF* does suggest that China is yet to embark seriously in this issue. This is because, these

independent variables could also serve as a cost of doing business and improvement would surely be able to reverse the inflows into China. There is room for China to improve its exchange rate, *GDP*, and fixed capital formation as attraction for *FDI* to inflows into China. This could be explained by the fact that although the ASEAN as a whole is not as populous as China, the purchasing power of the ASEAN is actually higher than China and therefore, could serve as a good avenue for high quality product of multinational corporations. Finally, the impact of trade openness is positive and significant, implying that maintaining the level of openness could be another good policy.

Due to positive development after accession of China in WTO, the ASEAN-5 countries need to explore the possible strategies for accelerating the flow of *FDI* to China. Since *FDI* is viewed as one of the major stimuli of cooperation, some areas to the cooperation among them should be identified and activated such as economic and investment cooperation, trade partnership, and technology development exchanges. Economic and investment cooperation, for instance, will contribute excellent prospects and better opportunities in a wide range of fields for promoting interaction, tightening relationship, and achieving mutual benefits in trade, investment, and industrial and commercial fields between China and ASEAN-5 countries as well as protecting the interests of all countries. The implementation of the ASEAN-China Free Trade Agreement in 2010, for example, has undoubtedly boosted bilateral trade and investment relations between China and ASEAN-5 countries.

Although China's accession into WTO will have an important impact on the ASEAN countries, especially when China's *FDI* intake and global share have increased in a period when global *FDI* inflows have contracted, China's rise should be interpreted as twin opportunity. This is because while *FDI* further promotes China's export, it also expands its domestic market where the ASEAN countries can directly benefit by recording surging exports to China. At the same time, China's cost competitiveness forces the ASEAN countries to move up the value chain by shifting from low technology manufacturing to higher value added, pushing for economics as well as industrial transformation. It would take several years before China exports *FDI* in significant amounts. The ASEAN countries should take this opportunity to actively pursue, instead of encumber economic cooperation and free trade with China.

In short, the empirical results confirm that inflows of *FDI* into China by the ASEAN-5 countries are significantly influenced by all selected variables except exchange rate. Therefore, the macroeconomic fundamental changes are important factors that attract the ASEAN-5 to invest capital in China. The ASEAN-5 countries have also an important stake in encouraging *FDI* inflows in China. For sustaining and enhancing good cooperation between China and the ASEAN-5 countries, the future flow of *FDI* from these countries need to be maintained through mutual benefit agreement and effective foreign investment policies.

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## **An Estimation of the Consumption Function Under the Permanent Income Hypothesis: The Case of D-8 Countries**

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This study examines the consumption function formed on the permanent income hypothesis. It covers eight countries that are member to the Organization of Islamic Cooperation (D-8) based on the annual data from 1980 to 2010. The model employed in this study takes into consideration both the adaptive expectations model and a combination of the partial adjustment model and the adaptive expectations model. The techniques used in time series analysis have been utilized as econometric models. Empirical results include evidences supporting the consumption function formed in accordance with the permanent income hypothesis and the adaptive expectations model.

### **1. Introduction**

Consumption expenditures constitute an important part of national income. Marginal propensity to consume determines the size of multiplier and the dynamic effects of economic shocks. The higher the multiplier is, the more economic fluctuations there are. While the multiplier and the marginal propensity to consume have high values as per the Keynesian absolute income hypothesis, they are expected to have lower values in the theories based on inter-temporal utility maximization such as the permanent income hypothesis (Friedman, 1957) and the life-cycle income hypothesis (Modigliani and Brumberg, 1954). In addition, the validity of Ricardian equivalence theorem depends on the validity of the permanent income hypothesis and the life-cycle income hypothesis. Although the permanent income hypothesis and the life-cycle income hypothesis bear a similar optimization model and results, mostly the permanent income hypothesis is used in empirical studies.

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Developed by Milton Friedman in 1957, the Permanent Income Hypothesis argues that the most important factor determining consumption expenditures is permanent income. As per the permanent income hypothesis, people determine permanent income within the framework of the adaptive expectations hypothesis. According to Friedman, current consumption expenditures in a particular period ( $C_t$ ) consist of two elements: permanent consumption expenditures ( $C_t^p$ ), and temporary consumption expenditures ( $C_t^T$ ).

$$C_t = C_t^p + C_t^T \quad (1)$$

In a similar way, current income ( $Y_t$ ) also consists of two parts: permanent income ( $Y_t^p$ ) and temporary income ( $Y_t^T$ )

$$Y_t = Y_t^p + Y_t^T \quad (2)$$

Based on this fact, it is assumed that permanent income determines permanent consumption expenditures. It is possible to write this functional relationship considering related parameters as follows:

$$C_t^p = \alpha + \beta Y_t^p \quad (3)$$

$\alpha$  and  $\beta$  in the equation numbered (3) are the parameters to be estimated.

The purpose of this study is to estimate the consumption function for D-8 countries formed based on the equation numbered (3) according to the permanent income hypothesis. The demonstration of whether the income elasticity of demand varies among D-8 countries can be guiding for future studies.

## 2. Method and Data Set

Following the works of Katsouli (2006), the equation numbered (3) can be estimated by combining the partial adjustment model and the adaptive expectations model. The permanent income in the permanent income hypothesis is not an empirically observable size contrary to measured income. The combination of the above-mentioned models makes it possible to convert non-observable variables of permanent

consumption expenditures ( $C_t^p$ ) and permanent income ( $Y_t^p$ ) into observable variables. The model indicated below has been obtained based on the models proposed in Manitsaris (2006) and Seddighi et al. (2000).

$$C_t^p = \alpha + \beta Y_t^p \quad (4)$$

$$C_t - C_{t-1} = \gamma(C_t^p - C_{t-1}^p) + \varepsilon_t, \quad 0 < \gamma \leq 1 \quad (5)$$

$$Y_t^p - Y_{t-1}^p = \theta(Y_t - Y_{t-1}^p), \quad 0 < \theta \leq 1 \quad (6)$$

Here,  $\gamma$  is partial adjustment coefficient, and  $\theta$  is adaptive expectations coefficient. The following equation is obtained when the equation systems numbered (4), (5), and (6) are solved (Manitsaris, 2006):

$$C_t = \alpha\gamma\theta + \beta\gamma\theta Y_t + [(1-\theta) + (1-\gamma)]C_{t-1} - (1-\theta)(1-\gamma) + C_{t-2} + [\varepsilon_t - (1-\theta)\varepsilon_{t-1}] \quad (7)$$

On the other hand, the following equation is obtained when the equation numbered (1) is inserted into its place in the equation numbered (3):

$$C_t = \alpha + \beta Y_t^p + C_t^T \quad (8)$$

It is possible to write this equation through econometric terms by taking into account the error term:

$$C_t = \alpha + \beta Y_t^p + u_t \quad \text{Where } u_t = \varepsilon_t + C_t^T \quad (9)$$

The following solution can be obtained based on the equations numbered (6) and (8):

$$C_t = \alpha\theta + \beta\theta Y_t + (1-\theta)C_{t-1} + [u_t - (1-\theta)u_{t-1}] \quad (10)$$

In this way, it becomes possible to estimate the equations numbered (7) and (10) based on actual values (not observable values). This study covers the period between 1980 and 2010. Necessary data related to D-8 countries have been taken from the database of the World Bank. The definitions about the said variables are given below:

$Y_t$  = Disposable Income (US\$, as per the prices in 2000)

$C_t$  = Private Final Consumption Expenditures (US\$, as per the prices in 2000)

### 3. Empirical Findings

If it is argued that there is a statistically significant relationship between two time series, it is needed to determine the orders of stationarity of the series by means of a unit root test in order to realize whether the said relationship is real or spurious. If both series have the same order of stationary (integration), the said relationship is real, which means a real regression. Thus, these series are called co-integrated series. In other words, series need to be co-integrated series (series having the same order of stationary) in order for the regression to be considered real. If the mean, variance, and autocovariance of a time series are time-independent and finite, such time series is considered covariance stationary. If a time series becomes stationary after difference is removed  $d$  times, it is deemed to become integrated at  $d$  order and is expressed as  $I(d)$ .

In order to test the unit root in time series, Augmented Dickey Fuller (ADF) Test is the most common method in literature. The equation which has lagged values in the dependent variable can be formulated with an intercept and time trend as follows:

$$\Delta y_t = \mu + \beta t + \delta y_{t-1} + \sum_{j=1}^k \alpha_j \Delta y_{t-j} + \varepsilon_t \quad (12)$$

$\Delta$  is the difference operator,  $t$  is the time trend,  $\varepsilon$  is the error term,  $y_t$  is the series investigated and  $k$  is the lag number. ADF assumes that the error term is statistically independently distributed and it has a constant variance. Besides, it is important to select the lag numbers correctly for the power of the test and significance level of the parameters (Said and Dickey, 1984). ADF test depends on the estimation of the parameter  $\delta$ . If  $\delta$  is different from zero and statistically significant, then the hypothesis which shows the series has a non stationary process is rejected. Philips-Perron test (1988) has been developed to control the high frequency correlation and it does not give way to the limitation of

the assumptions. Therefore Philips-Perron test (1984) is a complementary unit root test for the ADF test. PP test does not include enough lag values of the dependent variable in the model, so Newey-West estimator is performed to remove the autocorrelation problem in the model. As the absolute value of  $\tau$  in ADF test is greater than the absolute value of Mac-Kinnon critical values, the series has a non-stationary process. Table 1 presents the ADF, PP, KPSS and DF test results for each series:

**Table 1:** Unit root test results for D-8 member states

| D-8 member state                       | Log( $Y_t$ ) |                |           |          | Log ( $C_t$ ) |                |           |          |
|----------------------------------------|--------------|----------------|-----------|----------|---------------|----------------|-----------|----------|
|                                        | ADF          | PP             | KPSS      | DF       | ADF           | PP             | KPSS      | DF       |
| Iran                                   | -3.91(0)**   | -1.59(3)       | 0.08(3)*  | -2.69(0) | -3.76(0)      | -4.43(2)*      | 0.12(3)** | -3.18(0) |
| Pakistan                               | -1.40(0)     | -1.60(1)       | 0.21(3)   | -1.80(0) | -1.45(0)      | -1.36(4)       | 0.21(0)** | -1.69(0) |
| Bangladesh                             | -0.70(0)     | -0.71(0)       | 0.19(4)   | -0.86(0) | -2.00(0)      | -2.00(0)       | 0.19(3)   | -2.07(0) |
| Indonesia                              | -2.35(0)     | -2.27(3)       | 0.18(4)   | -2.08(0) | -1.66(0)      | -1.76(2)       | 0.23(4)** | -1.75(0) |
| Egypt                                  | -4.32(3)*    | -<br>4.20(3)** | 0.21(4)** | -3.08(3) | -3.64(3)      | -<br>4.52(4)** | 0.10(4)*  | -3.01(3) |
| Malaysia                               | -2.14(0)     | -2.14(0)       | 0.20(3)   | -2.08(0) | -2.21(0)      | -2.24(4)       | 0.20(3)   | -2.25(0) |
| Turkey                                 | 1.41(1)      | 4.43(3)        | 0.19(3)   | -0.26(1) | -0.83(1)      | -2.17(2)       | 0.18(4)   | -1.18(1) |
| D-8 Members                            | -2.04(0)     | -2.05(1)       | 0.22(4)   | -1.65(0) | -1.34(0)      | -1.52(2)       | 0.26(4)   | -1.43(0) |
| <b>McKinnon (1996) Critical Values</b> |              |                |           |          |               |                |           |          |
| Significant Level                      |              |                |           |          |               |                |           |          |
| 1 %                                    | -4.30        | -4.30          | 0.22      | -3.77    | -4.30         | -4.30          | 0.22      | -3.77    |
| 5 %                                    | -3.57        | -3.57          | 0.15      | -3.19    | -3.57         | -3.57          | 0.15      | -3.19    |
| 10 %                                   | -3.22        | -3.22          | 0.12      | -2.89    | -3.22         | -3.22          | 0.12      | -2.89    |

**Table 1 (Continued):** Unit root test results for D-8 member states

| D-8 member<br>state                                                                                                                                                                                                                                                                                                                                                                                                         | $\Delta \text{Log}(Y_t)$ |           |              |           | $\Delta \text{Log}(C_t)$ |           |          |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------|--------------|-----------|--------------------------|-----------|----------|-----------|
|                                                                                                                                                                                                                                                                                                                                                                                                                             | ADF                      | PP        | KPSS         | DF        | ADF                      | PP        | KPSS     | DF        |
| Iran                                                                                                                                                                                                                                                                                                                                                                                                                        | ---                      | ---       | ---          | ---       | ---                      | ---       | ---      | ---       |
| Pakistan                                                                                                                                                                                                                                                                                                                                                                                                                    | -5.00(0)*                | -4.99(3)* | 0.20(2)<br>* | -4.66(0)* | -4.49(0)*                | -4.41(6)* | 0.22(4)* | -4.36(0)* |
| Bangladesh                                                                                                                                                                                                                                                                                                                                                                                                                  | -4.08(0)*                | -4.09(2)* | 0.37(3)<br>* | -3.91(0)* | -4.63(0)*                | -4.62(2)* | 0.06(1)* | -4.54(0)* |
| Indonesia                                                                                                                                                                                                                                                                                                                                                                                                                   | -6.03(0)*                | -6.02(1)* | 0.20(2)<br>* | -6.08(0)* | -4.90(0)*                | -4.91(1)* | 0.10(1)* | -4.78(0)* |
| Egypt                                                                                                                                                                                                                                                                                                                                                                                                                       | ---                      | ---       | ---          | ---       | ---                      | ---       | ---      | ---       |
| Malaysia                                                                                                                                                                                                                                                                                                                                                                                                                    | -4.69(0)*                | -4.66(2)* | 0.08(1)<br>* | -4.77(0)* | -4.39(1)*                | -4.02(7)* | 0.09(5)* | -4.28(1)* |
| Turkey                                                                                                                                                                                                                                                                                                                                                                                                                      | -<br>10.65(0)*           | -10.5(1)* | 0.50(4)<br>* | -0.74(1)* | -7.36(0)*                | -7.51(2)* | 0.11(5)* | -7.07(0)* |
| D-8<br>Members                                                                                                                                                                                                                                                                                                                                                                                                              | -4.56(0)*                | -4.56(1)* | 0.22(2)<br>* | -4.65(0)* | -4.35(0)*                | -4.32(2)* | 0.13(2)* | -4.24(0)* |
| <b>McKinnon (1996) Critical Values</b>                                                                                                                                                                                                                                                                                                                                                                                      |                          |           |              |           |                          |           |          |           |
| Significant<br>Level                                                                                                                                                                                                                                                                                                                                                                                                        |                          |           |              |           |                          |           |          |           |
| 1 %                                                                                                                                                                                                                                                                                                                                                                                                                         | -3.68                    | -3.68     | 0.74         | -2.65     | -3.68                    | -3.68     | 0.74     | -3.77     |
| 5 %                                                                                                                                                                                                                                                                                                                                                                                                                         | -2.97                    | -2.97     | 0.46         | -3.19     | -2.97                    | -1.95     | 0.46     | -3.19     |
| 10 %                                                                                                                                                                                                                                                                                                                                                                                                                        | -2.62                    | -2.62     | 0.35         | -2.89     | -2.62                    | -1.61     | 0.35     | -2.89     |
| All variables expressed in logarithms. $\Delta$ shows the first-difference operator. Figures in the parentheses from the unit root test results are the lag values which show there is not an autocorrelation according to SIC. But for the PP test, the numbers in the parenthesis are the optimal Newey-West lag values. * and **, *** denote the rejection of the null hypothesis at 1%, 5% and %10 level, respectively. |                          |           |              |           |                          |           |          |           |

Based on the analysis results presented in the table 1, since the absolute values of ADF, PP, and DF test statistics are lower than the absolute values of Mac-Kinnon critical values for level values of all series in all countries except for Iran and Egypt,  $H_0$  hypothesis, which states that series involve unit root, thus are not stationary, has been accepted. These results demonstrate that not all series are stationary at their levels. All series have been determined to be stationary when their differences have been removed. Differently from other tests, KPSS (1992) test indicates that the series is stationary under null hypothesis.

KPSS test results show that not all levels are stationary at level value at the significance level of 5%, but they are difference stationary.

The ARDL bound test approach has been considered appropriate for the calculation of the income elasticity of consumption for Iran and Egypt. Two-stage Engle-Granger co-integration test has been implemented for other D-8 countries. Nigeria has been excluded from analysis since are not necessary data for that country. Table 2 shows the results of co-integration test for the countries other than Iran and Egypt:

**Table 2:** Regression results for Equation (10):  
Dependent variable  $\log(C_t)$

|                                    | Turkey  | Iran*   | Pakistan | Bangladesh | Indonesia | Egypt*  | Malaysia | D-8 M.  |
|------------------------------------|---------|---------|----------|------------|-----------|---------|----------|---------|
| <b>Constant</b>                    | 0.897   | 0.839   | -0.291   | 0.049      | 0.169     | -0.137  | 0.837    | -0.055  |
|                                    | [0.009] | [0.000] | [0.039]  | [0.974]    | [0.813]   | [0.285] | [0.042]  | [0.833] |
| <b>Log( <math>Y_t</math> )</b>     | 0.365   | 0.409   | 0.669    | 0.153      | 0.595     | 0.757   | 0.656    | 0.624   |
|                                    | [0.000] | [0.000] | [0.000]  | [0.000]    | [0.000]   | [0.000] | [0.000]  | [0.000] |
| <b>Log( <math>C_{t-1}</math> )</b> | 0.442   | 0.562   | 0.324    | 0.839      | 0.393     | 0.240   | 0.293    | 0.369   |
|                                    | [0.000] | [0.011] | [0.000]  | [0.000]    | [0.033]   | [0.001] | [0.002]  | [0.019] |
| <b>AR (1)</b>                      | -       | -       | -        | -          | 0.643     | -       | -        | -       |
|                                    |         |         |          |            | [0.015]   |         |          |         |
| <b>MA (1)</b>                      | -       | -       | 0.180    | 0.099      | 0.275     | -       | 0.652    | 0.509   |
|                                    |         |         | [0.320]  | [0.693]    | [0.013]   |         | [0.000]  | [0.001] |
| <b>Trend</b>                       | -0.009  |         | -        | -          | -         | -       | -        | -       |
|                                    | [0.061] |         |          |            |           |         |          |         |
| <b>Adj. <math>R^2</math></b>       | 0.843   | 0.999   | 0.999    | 0.968      | 0.998     | 0.999   | 0.998    | 0.998   |
| <b>DW</b>                          | 2.087   | 1.967   | 1.851    | 1.528      | 2.265     | 2.706   | 1.807    | 2.104   |
| <b>LM (1)</b>                      | 0.179   | 0.970   | 0.093    | 0.193      | 0.911     | 0.048   | 0.443    | 0.097   |
| <b>JB</b>                          | 0.492   | 0.989   | 0.768    | 0.053      | 0.984     | 0.914   | 0.102    | 0.787   |
| <b>WH</b>                          | 0.539   | 0.777   | 0.306    | 0.184      | 0.063     | 0.605   | 0.184    | 0.184   |
| <b>ARCH(1)</b>                     | 0.703   | -       | 0.717    | 0.833      | 0.991     | -       | 0.906    | 0.319   |

Notes: Test statistics in the table have been obtained from ARDL bound test approach for Iran and Egypt. Values in parentheses are p-values. DW = Durbin – Watson statistic for autocorrelation. LM(1) = Lagrange multiplier statistic of order one for autocorrelation. JB = Jarque–Bera statistic for normality. WH = White heteroskedasticity statistic. ARCH(1) = Autoregressive conditional heteroskedasticity statistic of order one.

At the second stage of Engle-Granger two-stage cointegration test, error terms have been drawn from the regression equation for each country, thus the stationary of error terms series has been searched. Since  $\tau$ -statistic (ADF test statistic) obtained at the end of the ADF is higher than the table value in terms of absolute value, that is to say  $e_t$  error term is  $I(0)$ , there is a relationship between two time series in the long

term. The table 3 presents the results of unit root test pertaining to the error term:

**Table 3:** Results of Cointegration test for D-8 member states

| D-8 member state                       | ADF       | P-value |
|----------------------------------------|-----------|---------|
| Pakistan                               | -4.27(0)  | 0.0001  |
| Bangladesh                             | -4.90(0)  | 0.0000  |
| Indonesia                              | -5.04(1)  | 0.0000  |
| Malaysia                               | -4.85(0)  | 0.0000  |
| Turkey                                 | -5.57(1)  | 0.0000  |
| D-8 Members                            | -5.27 (0) | 0.0000  |
| <b>McKinnon (1996) Critical Values</b> |           |         |
| Significant Level                      |           |         |
| 1 %                                    | -2.65     |         |
| 5 %                                    | -1.95     |         |
| 10 %                                   | -1.61     |         |
|                                        |           |         |
|                                        |           |         |

Notes: Values in parentheses indicate the optimal length of the lag. The optimum lag length (p) selection is based on minimizing Akaike Information Criterion (AIC).

Test results show that the error terms obtained from the cointegration regressions pertaining to countries are stationary at level value. Since the absolute value of the ADF test statistic estimated for all regression equations is higher than the absolute values of Mac-Kinnon critical values, it is concluded that there is not unit root and the error term is stationary, thus there is a long-term relationship between the variables.

When some of the series are stationary at level and some of them are stationary at first difference level  $I(1)$ , we can not apply on the traditional cointegration test. This problem can be removed by the Autoregressive Distributed Lag (ARDL) model and the bound test approach which is developed by Paseran, Shin and Smith (2001) to observe the long run relationship between the variables. The cointegration method used here, the ARDL method allows testing for a long-run relationship between variables of mixed order of integration (Paseran et al., 2001). There are many advantages of using ARDL model for testing the private investment model on Turkey. The main advantage of this method is that ARDL avoid the pre-testing problems in data. Bound test approach can be applied to studies that have a small size while Engle and Granger (1987) and Johansen (1988, 1995)

methods of cointegration are not reliable for small sample sizes (Enders, 1995; Banerjee vd., 1993).

The results of ARDL test calculated for Iran and Egypt are given in the table below:

**Table 4: Results of Cointegration Test**

| Iran                     |                                                            |              |                                       |              |
|--------------------------|------------------------------------------------------------|--------------|---------------------------------------|--------------|
| <b>Lag structure :</b>   | ARDL ( 1 , 0 )                                             |              |                                       |              |
| <b>F – statistics :</b>  | 5.749                                                      |              |                                       |              |
| <b>k :</b>               | 1                                                          |              |                                       |              |
| <b>Significant level</b> | <b>Critical values for the bounds test (Narayan, 2004)</b> |              |                                       |              |
|                          | <b>Restricted intercept and no trend</b>                   |              | <b>Restricted intercept and trend</b> |              |
|                          | I(0)                                                       | I(1)         | I(0)                                  | I(1)         |
| 1 %                      | 6.027                                                      | 6.760        | 8.170                                 | 9.285        |
| 5 %                      | <b>4.090</b>                                               | <b>4.663</b> | <b>5.390</b>                          | <b>6.350</b> |
| 10 %                     | 3.303                                                      | 3.797        | 4.290                                 | 5.080        |
| Egypt                    |                                                            |              |                                       |              |
| <b>Lag structure :</b>   | ARDL ( 1 , 0 )                                             |              |                                       |              |
| <b>F – statistics :</b>  | 6.481                                                      |              |                                       |              |
| <b>k :</b>               | 1                                                          |              |                                       |              |
| <b>Significant level</b> | <b>Critical values for the bounds test (Narayan, 2004)</b> |              |                                       |              |
|                          | <b>Restricted intercept and no trend</b>                   |              | <b>Restricted intercept and trend</b> |              |
|                          | I(0)                                                       | I(1)         | I(0)                                  | I(1)         |
| 1 %                      | 6.027                                                      | 6.760        | 8.170                                 | 9.285        |
| 5 %                      | <b>4.090</b>                                               | <b>4.663</b> | <b>5.395</b>                          | <b>6.350</b> |
| 10 %                     | 3.303                                                      | 3.797        | 4.290                                 | 5.080        |

**Note:** The critical value is reported in the same table which based on critical value suggested by Narayan (2004) using small sample size between 30 and 80. Lag orders of the lags in the ARDL model are selected by either the AIC or SBC. For annual data, Paseran and Shin (2001) recommended choosing a maximum of 2 lags.

The calculated F-statistics (F-statistic = 5.749) is higher than the upper bound critical value at 5 per cent level of significance (4.663) for Iran, using restricted intercept and no trend. But the F-statistic is only higher than the upper bound critical value at 10 per cent level of significance (5.080), using restricted intercept and trend. The calculated F statistic (F-statistic = 6.481) is higher than the upper bound critical value at 5 per cent for Egypt, restricted using intercept and trend or restricted intercept and no trend. This implies that the null hypothesis of no cointegration cannot be accepted at 5 per cent and 10 per cent level and

therefore, there is cointegration relationship among the variables. The values about ARDL long-term coefficients obtained for Iran and Egypt are given in the table 2 so as not to disrupt the integrity.

Table 5 presents the income elasticity values obtained based on the coefficients related to variables by means of the equations numbered 6 and 10.

**Table 5:** Short-run and Long-run Elasticities of Consumption With Respect to Income and Adjustment Coefficients

| D-8 member tate | Elasticity of consumption with respect to actual income | Adaptive expectations adjustment coefficient ( $\delta$ ) (Eq. 6) | Elasticity of consumption with respect to permanent income ( $\beta$ ) (Eq. 10) |
|-----------------|---------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Iran            | 0.409                                                   | 0.438                                                             | 0.934                                                                           |
| Pakistan        | 0.669                                                   | 0.676                                                             | 0.989                                                                           |
| Bangladesh      | 0.153                                                   | 0.161                                                             | 0.950                                                                           |
| Indonesia       | 0.595                                                   | 0.607                                                             | 0.980                                                                           |
| Egypt           | 0.757                                                   | 0.760                                                             | 0.996                                                                           |
| Malaysia        | 0.656                                                   | 0.707                                                             | 0.927                                                                           |
| Turkey          | 0.365                                                   | 0.558                                                             | 0.654                                                                           |
| D-8 Members     | 0.624                                                   | 0.631                                                             | 0.989                                                                           |

#### 4. Conclusion

The table 2 presents the consumption elasticity values based on current income for D-8 countries obtained from the equation numbered 10. By using these elasticity values, the adaptive expectations adjustment coefficients and consumption elasticity values based on permanent income have been calculated for each country based on the equations numbered 6 and 10 respectively. These values are given in the table 5. For instance, the consumption elasticity value based on current income included in the first column of the table has been found to be 0.624 for all D-8 countries. This elasticity value shows that an increase of 1% that can occur in the current income (*ceteris paribus*) will increase current consumption by 0.624%. However, if this increase in income continues, consumption elasticity obtained based on permanent income will become 0.989. This result means that an increase of 1% in permanent income will increase current consumption by 0.989%. When both consumption elasticity values are compared (short-term elasticity value= 0.624 and long-term elasticity value= 0.989), it is possible to say that consumers will realize approximately two thirds of their

expectations in any period because the adaptive expectations coefficient has been estimated to be 0.631. However, these results should be cautiously evaluated by considering the criticisms in the literature about calculation or estimation methods used at every stage of our study.

Test results considerably support the consumption function formed based on the permanent income hypothesis and the adaptive expectation model. The determination of whether the consumption elasticity based on permanent income is different between D-8 countries may be guiding for generating macroeconomic policies. D-8 countries are grouped based on the adaptive expectations adjustment coefficient, current income, and consumption elasticity based on permanent income (respectively) as follows:

The categorization of D-8 members by adaptive expectations adjustment coefficient:

Low: Bangladesh

Medium: Iran, Italy

High: Pakistan, Indonesia, Egypt, Malaysia

The categorization of D-8 members by current income consumption elasticity:

Low: Bangladesh, Turkey

Medium: Iran, Indonesia

High: Pakistan, Malaysia, Egypt

The categorization of D-8 members by permanent income consumption elasticity values:

Low: Turkey

Medium: Malaysia, Iran, Bangladesh

High: Indonesia, Egypt, Pakistan

As can be seen in the categorizations above, consumption elasticity based on permanent income varies between different D-8 countries. Thus, any economic policy that can affect income may have different impacts on D-8 countries. However, these estimation results, which have been obtained based on econometric analyses, should be cautiously evaluated. This is because; the estimation procedure taken as basis in this study does not follow any instrumental variable method, and estimation coefficients may deprive of internal consistencies. On the other hand, this study conducted on D-8 members may contribute to future studies, and have a contributory impact on the generation of macroeconomic policies, though partly.

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## **Fiscal and Monetary Regime Identification for Price Stability in Case of Pakistan's Economy**

Attiya Y. Javid<sup>1</sup> and Umaima Arif

The study examines the relative importance of fiscal and monetary determinants of inflation for Pakistan during 1960-2011. By analyzing the impulse response functions, the relationship linking liabilities to GDP with surpluses to GDP, verify monetary regime. The study finds that the incident of wealth effects of adjustment in nominal public debt may pass through to prices by escalating inflation variability as predicted by the fiscal theory of price determination. The results do not support the perception that monetary authorities acted consistently with monetary dominant regime in Pakistani case to accommodate the fiscal shocks. A positive shock in inflation leads to the negative response of reserve money growth which is consistent with monetary dominant regime. However discount rate that responds negatively to inflation shock is in line with fiscal dominant regime. The different set of analysis leads to implication that nominal public liabilities, as revealing either in money growth or in nominal public debt, influence price stability in case of Pakistan. The authorities may be following different regimes for different time periods during the 1960-2011.

### **1 .Introduction**

Fiscal deficit is a well debated issue in macroeconomic literature for its effects on the indicators of macroeconomic performance such as inflation, growth, financing and proceeding debt dynamics. The government's intertemporal budget constraint is satisfied when the current value of the net liabilities is equal to the discounted present value of the future primary surpluses (tax revenue minus non-interest expenditures). The current fiscal policy is considered to be sustainable if the government's intertemporal budget constraint is satisfied without adjustment in either policy or the price level. However government's

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adjustment in primary deficit to restrict debt accumulation coupled with non monetization of debt by the central bank leads to monetary dominant (MD) or Ricardian regime. On the other hand, independence of primary deficits from real liabilities leads to fiscal dominant (FD) or non-Ricardian regime (Sargent and Wallace 1981).

In fiscal theory of price level, dominant characteristics of policy determine the results of fiscal and monetary policy with policy outcome depending on active and passive attributes of policy. If monetary policy is active and fiscal policy is passive then fiscal policy accommodates monetary policy and are defined as dominant monetary policy or Ricardian regime (Aiyagari and Gertler, 1985; Sims, 1994; Sargent and Wallace, 1981 and Woodford, 1994, 1995; Cochrane, 1999, 2003). On the other hand if monetary policy is passive and fiscal policy is active then monetary policy accommodates fiscal policy and is defined as dominant fiscal policy and non-Ricardian regime (Sargent and Wallace, 1981 and Woodford, 1994, 1995; Cochrane (1999, 2005).

Fiscal deficit results in inflation because governments that face continual fiscal deficits find money creation a solution to finance the deficits leading to inflation as a monetary phenomenon. The fiscal theory of price level [Leeper (1991), Woodford (1994, 1995) and Sims (1994)] postulates that a fiscal dominant or non-Ricardian regime may occur when fiscal policy is not sustainable and government bonds are deemed as net wealth. These wealth effects could make it difficult to meet the goal of price stability without taking into account the central bank's commitment to low inflation (Woodford, 1994 and 1998; Leeper, 1991; Sims, 1994 and Cochrane, 1998 and 1999). The implication is that in fiscal regime the government's fiscal policy is sustainable through debt deflation. That is, an increase in prices that corrode the real value of public debt and in turn the real value of financial wealth until demand equals supply and a new equilibrium is reached. Therefore, prices are determined by fiscal policy, and inflation becomes a fiscal phenomenon.

According to Quantity Theory of Money (QTM), whenever the solvency condition violates, the government is required to make adjustments in revenue or expenditure, or both fulfill the solvency condition. However, the fiscal theory of price level takes the same intertemporal budget equation as an equilibrium condition including the determination of the

price level. Whenever the solvency condition violates, the market-clearing mechanism will adjust the price level to re-establish equilibrium. This implies that, if there is an increase in the nominal stock of liabilities coupled with market anticipating a fall in future primary surpluses then to reach a new equilibrium the real value of government debt would need to fall. Ultimately, with no alteration in primary surpluses, a new equilibrium could only be achieved with increase in prices. As a result, the fiscal theory of price level implies that if primary surpluses tend to be arbitrary and weakly correlated or uncorrelated with public liabilities, prices will have to adjust to guarantee the fiscal solvency, and a fiscally dominant (FD) regime would exist, even if monetary policy is not accommodative of fiscal needs. This situation would then lead fiscal policy to become the nominal anchor to determine the price level. On the other hand, if primary surpluses adjust promptly to limit or condense the growth of public liabilities, fiscal solvency is ensured for any price level. That is, monetary dominant (MD) regime would prevail and monetary policy is conducted independent of government financing requirements and becomes the nominal anchor for economic stability.

The current study is an extension of earlier work in which the test of fiscal theory of price level (FTPL) is conducted for Pakistan's economy by applying the Canzoneri, Cumby and Diba CCD (2001) approach. The evidence does not support that authorities are following a certain type of regime during the sample period 1970-2007 (Javid, Arif and Sattar, 2009). In this study the model is extended by adding discount rate in CCD original model to check the robustness of the model. The relative importance of fiscal policy and monetary policy for price stability is examined by investigating main fiscal and monetary determinants of inflationary process in Pakistan. Further, as a robustness check it is investigated that the monetary authorities have tried more actively to relieve shocks in inflation. The motivation comes from the fact that State Bank of Pakistan is committed to low inflation. Increasing inflation raises concerns that persistent budget deficits and large stock of nominal public debt increase the possibility of creating inflation out of fiscal imbalances. Therefore considering the relevance of the issue in recent economic scenario, it is important to explore that price level depends on which regime. In monetary regime price level is determined by the demand for liquidity and the way it evolves over time. In fiscal

regime, it is the total supply of outside assets (base money plus government bonds) that matters. In addition, in fiscal regimes, monetary policy has to work through seigniorage, and the government's budget constraint, if it is to control the price level; in monetary regimes, monetary policy works through conventional channels. Canzoneri *et al.* (2001) approach does not give a clear picture of which regime is dominant. Thus it necessitate to look for evidence that wealth effect could be jeopardizing the objective of price stability. To achieve price stability it is necessary to have appropriate fiscal policy and also an adequate monetary policy. This motivates to identify whether Pakistan's economy is dominated by a fiscal or monetary regime and to examine the main fiscal and monetary determinants of the inflationary process. To distinguish between these two regimes, the intertemporal budget constraint (IBC) approach initiated by Hamilton and Flavin (1986) is used. The intertemporal budget constraint imposes restrictions on the long run relationship between primary surplus and public liabilities which implies that these two series move with each other. Therefore, the time-series techniques are more appropriate in providing testing procedures on the issue of price stability through the intertemporal budget balance (Trehan and Ramos, 2002).

The plan of rest of study is as follows: Section 2 reviews briefly the empirical literature on the relative importance of fiscal and monetary policies for price stability. The empirical methodology to differentiate between monetary and fiscal dominance and data are discussed in section 3. The empirical results are provided in section 4 and the last section offers conclusion.

## 2. Literature Review

Several studies have strived to evaluate the interaction of monetary and fiscal policy and policy regime identification subsequent to Sargent and Wallace (1981) influential work. Melitz (1997, 2002) finds that monetary and fiscal policy have a tendency to move in opposite directions while estimating the reaction functions of the monetary and fiscal authorities on a pool of nineteen OECD countries over the period 1960–95. Favero (2002) concludes that stabilization of inflation has been realized autonomously in Europe from the lack of fiscal discipline.

Hence sustaining the inspiration that the monetary authorities in the European area have been capable to affect inflation rates. Favero and Monacelli (2003) find some facts of fiscal dominance in the United States for limited periods of time spanning over 1960 to 87. They conclude that there is potential to recognize time windows where an empirical model consisting of both monetary and fiscal regime is capable to follow the dynamics of inflation much better than a system based on a monetary rule only. Erdogdu (2002), Creel and Sterdyniak (2002), and Mikek (1999) obtain Ricardian results for the US economy by using VAR approaches. The aim was to investigate the responses of primary surpluses to domestic debt and they finally conclude that the dominant monetary policy has been accommodated by Ricardian policies in the U.S.

The introduction of the fiscal theory of the price level has recognized another channel through which the central bank can lose control of inflation. This is even in the case of an independent monetary authority that need not accept seignorage targets stated by the fiscal authority. Cochrane (1988, 1999), Auernheimer and Contreras (1990), Leeper (1991), Woodford (1994, 1995, 1996, 1998, 2000), Sims (1994, 1995, 1997, 1998), Canzoneri and Diba (1998), Canzoneri et al (2001, 2002, 2006), Dupor (1997), Bergin (2000), Christiano and Fitzgerald (2000), Schmitt-Grohe and Uribe (2000) and Benhabib et al (2001) are some studies done on this issue. This theory has found mixed empirical support. Canzoneri *et al.* (2001), for example, conclude that post-war US data are more consistent with a regime where monetary policy, and not fiscal policy, determines the price level and reach similar results to those of Bohn (1998). On the other hand, Cochrane (1998) argues that the US data from 1960 are consistent with the fiscal theory of the price level determination. Also Sala (2003) finds that the fiscal theory of the price level illustrates at least one phase of the post-war US history, in particular the period 1960–79. Afonso (2002) finds that the fiscal theory of the price level does not hold in case of fifteen European economies.

Very little empirical work is accomplished on emerging market countries including Tanner and Ramos (2002), who assess whether the policy regime in Brazil during the 1990s can be better illustrated as fiscal dominant. IMF (2003), while, approximating a separate fiscal policy reaction function for a group of developed economies and a set of

emerging markets explores that primary surpluses respond strongly to public debt in the developed countries. For Brazil the study by Loyo (2000) presents result consistent with the fiscal theory of the price level where a tight monetary policy along with loose fiscal policy leads to hyperinflation even without seignorage increase. Blanchard (2004) and Favero and Giavazzi (2004) find that in 2002 Brazil has huge public debt, the cost of debt service raised via an increase in interest rates to keep inflation within the target level. The debt level, the default probability and the country premium, prompting capital outflows leading to a depreciation of the exchange rate affects inflation prospects and eventually, inflation itself. Baldini and Ribineiro (2008) find in case of Sub-Saharan Africa for the period 1980-2005 a mixed finding as some countries are dominated by fiscal regime other by monetary regime and some countries have no clear outcome. Bildrici and Ersin (2007) scrutinize the relation between the price level and domestic debt for the period 1989-2004 and find Turkish political authorities are in general found to be following non-Ricardian fiscal rules. Cashin *et al.* (2003) and Tufail (2008) have examined the fiscal policy sustainability for Pakistan. The results of these studies seem to suggest that fiscal dominance might be an issue for emerging economies more than for developed ones. This motivates to distinguish between fiscal dominant and monetary dominant regime in case of Pakistan.

### 3. Methodological Framework and Data

The difference between the conventional view that is Quantity Theory of Money (QTM) and fiscal theory of price level (FTPL) lies basically in their dealing with government intertemporal budget constraint. The budget constraint explains that the value of government debt is equal to the present discounted value of future government revenues net of expenditures (deducing the interest payments) called primary surpluses. Following Canzoneri *et al.* (2001) the government budget constraint in nominal terms for period  $j$  is given below:

$$B_j = (T_j - G_j) + (M_{j+1} - M_j) + B_{j+1} / (1 + i_j) \quad (1)$$

Where  $M_j$  and  $B_j$  are the stocks of base money and government debt at the beginning of the period  $j$ ,  $T_j - G_j$  is the primary surplus during the

period  $j$  and  $i_t$  is the interest payments for the period  $j$ . This constraint says that the existing debt has to be paid off, monetized or refinanced. The budget constraint takes both surpluses and liabilities in terms of GDP. After few manipulations Canzoneri *et al.* (2001) rewrite the budget constraint as follows

$$\frac{M_j + B_j}{P_j y_j} = \left[ \frac{T_j - G_j}{P_j y_j} + \left( \frac{M_{j+1}}{P_j y_j} \right) \left( \frac{i_j}{1 + i_j} \right) \right] + \left( \frac{y_{j+1}/y_j}{(1 + i_j)(P_j/P_{j+1})} \right) \left( \frac{M_{j+1} + B_{j+1}}{P_{j+1} y_{j+1}} \right) \quad (2)$$

The equation (2) states that the ratio of the total government liabilities to GDP has to be equal to the primary surpluses (including central bank transfers) to GDP ratio plus the discounted value of next period liabilities to GDP ratio. The discount factor is the ratio of real growth in GDP to the real interest rate. With further simplified notation and equation (2) can be rewritten as

$$w_j = s_j + \alpha_j w_{j+1} \quad (3)$$

Where  $w_j$  is liabilities-to-GDP ratio,  $s_j$  is surplus-to-GDP ratio and  $\alpha_t$  is discount factor. Following Woodford (1995) iterating equation (3) one period ahead from the current period  $t$  and taking expectations conditional on information available in period  $t$ . The present value budget constraint becomes:

$$w_t = s_t + E_t \sum_{j=t+1}^{+\infty} \left( \prod_{k=t}^{j-1} \alpha_k \right) s_j \Leftrightarrow \lim_{T \rightarrow +\infty} E_t \left( \prod_{k=t}^{T+t-1} \alpha_k \right) w_{t+T} = 0 \quad (4)$$

The fiscal theory of price determination treats equation (4) as equilibrium condition that must be satisfied. The Hamilton and Flavin (1986) procedure is adopted to empirically test equation (4) and is tested as a government solvency condition. In this case, if primary surpluses are determined by an arbitrary process unrelated to primary debt, then nominal income and/or discount factor must jump in equilibrium to satisfy (4), called non-Ricardian or fiscal dominant regime. If on the other hand, primary surpluses are determined in such a way that (4) is always satisfied no matter what nominal income and discount factor are

determined elsewhere in the model, called the Ricardian or monetary dominant regime. Canzoneri *et al.* (2001) further suggest many fiscal policy rules lead to Ricardian regime. Let the sequence  $s_t$  is expected to follow the rule:

$$s_j = c_j w_j + \varepsilon_j \quad (5)$$

Where  $c_j$  is time varying response parameter  $\varepsilon_j$  is random variable which represents political factors and/or economic conditions.

Canzoneri *et al.* (2001) propose the following method to distinguish between monetary dominant or Ricardian regime and fiscal dominant or non-Ricardian regime. Considering, first, the temporal relationship running from current liabilities to future primary surpluses, a monetary dominant regime is ruled out if future primary surpluses respond negatively to increases in current liabilities, or if there is no relationship between the two variables, indicative of primary surpluses being exogenous. A positive connection between current primary surpluses innovations and future liabilities indicate that higher primary balances are generated to compensate positive changes in liabilities in order to bound debt accumulation, which would be consistent with a monetary dominant regime. However, according to the fiscal theory of the price level, such positive relationship could arise also under a fiscal dominant regime, in which the price level falls, and the real value of liabilities increases, in anticipation of future higher primary surpluses. Next consider the temporal relationship running from current primary surplus to future liabilities. Under a monetary dominant regime, current innovations to primary surpluses should be negatively related to future government liabilities, because rises in the primary surpluses would be used to pay the debt. On the other hand, under fiscal dominant regime, there would be no association between shocks to current primary surplus and future government liabilities.

To discriminate between MD and FD regime the analysis is done by estimating the VAR model over primary surpluses and liabilities. To account for possible lags in the variable response, impulse responses functions are used to trace the effect over time of current innovations in

the primary surplus on future liabilities and of current innovations in liabilities on future primary surplus.

For inflation variability an assessment has been made as which of the two policy variables: money growth or nominal debt growth can best explains inflation variability in Pakistan, after controlling for the aggregate demand measured by real output gap. Under a fiscal dominant regime, the main source of changes in the price level could be explained primarily by the associated wealth effects upon private consumption (Woodford, 1998)<sup>2</sup>. To test for the existence of these wealth effects, a VAR is estimated with the following ordering: nominal domestic debt growth, growth rate of reserve money, real output gap, inflation rate. Thereafter, the variance error decompositions for inflation are computed. These decompositions separate the variation in inflation into component shocks to the VAR, thus providing information about the relative importance of each random innovation in affecting inflation. If the forecast error is explained by shocks to nominal debt growth, it would imply that changes in the price level could be explained by the wealth effects of nominal debt growth, which would support the fiscal dominance by the fiscal theory of price level. If instead the forecast error is explained by shocks to money growth, it is an indication that monetary policy is passive and has accommodated shocks in debt through debt monetization, ultimately causing inflation. The quantity theory of money says that this inflation channel would be associated with a fiscal dominant regime<sup>3</sup>.

To examine, whether the monetary authority has tried more actively (using reserve money or discount rate) to alleviate shocks in inflation during the sample period, the VAR is estimated with the following ordering: real output gap, inflation, reserve money growth (or the discount rate). Then the impulse responses are estimated to investigate how the monetary instrument responds to an innovation in inflation. To test whether an active monetary policy is working, money growth rates

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<sup>2</sup>. This is because, with a fiscal dominant regime, a positive shock in domestic debt makes households perceive they can afford more lifetime consumption, leading to higher demand for goods, which drives up domestic prices.

<sup>3</sup> However, the increase in domestic debt could also be caused by an abrupt fall in output due to a shock exogenous or endogenous to the country increasing the need to finance the government deficits by increasing domestic debt.

should respond negatively or discount rates respond positively to a positive innovation in current inflation.

### **Robustness Analysis**

To prove the robustness of the results the cointegration approach suggested by Johansen 1991 is carried out using the full information maximum likelihood framework. The robustness analysis is based on two models. First model investigates feedback rules between primary surplus/GDP ( $s$ ) and domestic debt/GDP ( $w$ ) by following cointegration process and expands the model into VEC model. The second model estimates inflationary effects of debt in accordance with VEC model

Table 3 in appendix shows the result of the cointegration analysis based on testing the restriction of no more than  $r$  cointegration vectors against the alternative of  $r+1$  such vectors, the trace statistics test restriction of no more than  $r$  cointegration vectors against the alternative of  $r=0$ . The hypothesis cannot be rejected by both the maximum eigen value and the trace statistic values at the 95 % level. Following Cochrane (1998), feedback rules between primary surplus/GDP ( $s$ ) and primary liabilities/GDP ( $w$ ) are analyzed. [Canzoneri, *et. al.* (2001)]. Since both variables are cointegrated suggesting that, if fiscal policies react to liabilities accordingly, primary surpluses are expected to increase in order to satisfy the intertemporal budget constraint. Accordingly, primary surplus as a function of liabilities/GDP expected to follow a positive response. The estimation of feedback rules given by Ricardian regimes is expected to range between  $0 \leq c_j < 1$ ; consequently, an increase in domestic debt ought to be financed by an increase in primary surplus. On the other hand, primary surpluses might follow a positive path in Non-Ricardian regimes as well as Ricardian regimes; however, increases in primary surpluses might fail to compensate debt shocks, hence, prices has to increase to equate intertemporal budget constraint by lowering real value of debt.

As a result, empirical studies mentioned above propose a second feedback rule to be estimated, as  $w$  is a function of primary surplus  $s$  and expected to follow a decreasing path in Ricardian regimes. Hence, coefficient captures the response in domestic debt resulting from an innovation in primary surplus and expected to range between  $-1$  to  $0$  (Canzoneri, *et al.*: 2001).

## Data

The data series for this study are extracted from International Financial Statistics (IFS) CD-ROM.(2009) issued by International Monetary Fund, Pakistan Statistical Year Book 2010, Pakistan Economic Survey (various issues). The data set includes government expenditure, government revenues, consumer price index, reserve money, discount rate, and gross domestic product for the period 1960-2009. All data series are converted in to year 2000 rupees. Primary surplus is difference in overall public revenues and public expenditures (deducing the interest payments) all divided by nominal GDP. Public liabilities are defined as debt plus money base divided by nominal GDP. The real output gap is measured as deviation of actual GDP from potential GDP, where potential GDP is the fitted values of the quadratic trend on GDP series.

## 4. Empirical Results

The difference between monetary dominant (MD) regime and fiscal dominant (FD) regime is presented in this section. To empirically distinguish between these two regimes first, the methodology suggested by Canzoneri *et al.* (2001), and Tanner and Ramos (2002) is adopted using the Pakistani data. To estimate the relative importance of wealth effect of public debt and monetary growth in inflation pass through analysis approach is used. The relationship between inflation, aggregate demand and monetary policy instruments is investigated to test how State Bank responds to mitigate shocks in inflation. These three approaches use an unrestricted Vector Autoregressive Model (VAR) model to assess whether primary balances are set exogenous or dependent on public liabilities. The advantage of this methodology is that it only requires the estimation of a relatively small number of parameters and it does not impose any restrictions on the economy.

For estimation, first step is to test the stationarity of each variable. The Augmented Dickey-Fuller (ADF) unit root test is applied on primary surpluses, public liabilities, debt, inflation, reserve money, seigniorage and output gap including a constant and a trend. The ADF test results show the acceptance of the unit root in all series, that is, all the series are non-stationary at level, which is indicative of I(1) process, therefore all the variables are taken in first difference for further analysis.

The methodology of Canzoneri *et al.* (2001) is applied based on unrestricted VAR analysis which allows identifying monetary or fiscal dominant regimes by estimating the impulse response functions and variance decomposition. This test is based on impulse-responses analysis of future liabilities to GDP to a shock in surplus to GDP, conditional on the persistence of the surplus to GDP, estimated by its autocorrelation. A surplus to GDP with a positive autocorrelation up to 5 lags<sup>4</sup> is considered positive and persistent; otherwise the surplus is considered negatively autocorrelated, indicating low persistence<sup>5</sup>.

The two possible ordering of the surplus to GDP and liabilities to GDP are used in the model because the VAR methodology discloses possible inconsistency in the results due to the ordering adopted in the model. The order in which the surplus to GDP comes first allows for contemporaneous effect to innovation on liabilities to GDP, which is consistent with non-Ricardian or FD regime (where the nominal GDP should jump in equilibrium to cause the existing liabilities to equal the present discounted value from the surpluses). The order in which liabilities to GDP come first does not allow the contemporaneous effect on the liabilities, which makes more sense in the Ricardian regime.

The VAR is estimated with two lags and a constant. Figure 1 represents the plots of impulse response function estimated for both ordering of variables. In the first ordering where surplus to GDP comes first, the response of liabilities to an innovation in surplus to GDP is negative. In fact, the response of liabilities to GDP is negative for 10 years, regardless of the ordering used. The univariate autocorrelations and the corresponding Q-statistics for surplus reported in Table 1 indicate that

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<sup>4</sup> There is no consensus in the literature of fiscal theory of price level on the minimum number of lags to measure a high persistence of surplus. Canzoneri *et al.* (2001) find positive autocorrelation at lag up to 9 years for US. For emerging market economies Zoli (2005) and Baldini and Ribeiro (2001) argue that the fiscal policy is more volatile than developed markets and they use 5 lags. The average length for developing countries to complete business cycle is three years (Rand and Tarp (2002)).

<sup>5</sup> Assessing how public liabilities respond to a shock in the surplus to GDP, conditional on surpluses being positively and persistently autocorrelated, in a monetary dominant regime, an increase (or positive shock in the current surplus leads to a fall in future liabilities to guarantee fiscal solvency. As a result, a monetary dominant regime is identified by a negative relationship between current surpluses and future liabilities. Under a fiscal dominant regime, however, the fiscal surpluses are assumed to be exogenous, and therefore future liabilities should be either unresponsive to a current increase in surpluses or lead to an increase. The other possibilities do not allow identifying any of these two regimes, therefore unidentified or ambiguous results.

there is significant positive autocorrelation for all first lags of surplus to GDP ratio. If the surpluses to GDP are positively correlated and liabilities to GDP in period  $t+1$  onwards decreases, the results are in conformity with Ricardian or MD regime

To confirm the result, following Canzoneri *et al.* (2001) analysis has been done by assessing the behavior of GDP. According to Ricardian equivalence, changes in the government budget and public liabilities do not exert an effect on aggregate demand. In contrast, in non-Ricardian regime in the presence of nominal rigidity, it is believed that the aggregate demand variations resulting from fiscal shocks cause variation in the level of real economic activity and in real interest rate, as well as fluctuation in the inflation rate. To examine whether a positive innovation in the surplus to GDP reduces the nominal income in the same period and increases government liabilities, VAR is estimated with surplus to GDP, natural logarithm of liabilities and natural logarithm of GDP. As nominal GDP is expected to respond to the innovation in surplus in case of non-Ricardian regime, the impulse response functions are analyzed with ordering  $\ln(\text{liabilities})$ , surplus to GDP,  $\ln(\text{GDP})$ . The results of impulse response in Figure 2 indicate that the innovation in the surplus to GDP reduces not only the nominal income but also decreases the level of liabilities in the subsequent period. This suggests that these findings confirm the existence of Ricardian regime. This analysis indicates that there is commitment in the authorities towards surplus generating policies in order to reduce liabilities.

In the next stage, VAR is estimated involving surplus to GDP, liabilities to GDP and discount rate as proposed by Canzoneri *et al.* (2001) to examine whether or not impulse responses survive after controlling for discount rate. Figure 3 shows impulse responses to an innovation in surplus to GDP. In the top panel the ordering goes from surplus to GDP, liabilities to GDP, discount rate in line with non-Ricardian regime. In the bottom panel the ordering is liabilities to GDP, surplus to GDP and discount rate consistent with Ricardian regime. The response of liabilities/GDP to surplus shock is negative for four periods following the shock. The response of discount rate is positive and insignificant. The response of surplus to GDP and liabilities to GDP is as persistent as obtained without including discount rate, that is basic results are robust to controlling for discount rate implying that non-Ricardian regime is

not working. These results are consistent with emerging market results for example by Fialho and Portugal (2005) for Brazil, Baldini and Ribeiro (2008) for some Sub-Saharan African countries: Cameroon, Kenya, Nigeria, Rwanda and South Africa.

The wealth effect pass through analysis on price is done by decomposition of inflation variability reported in Table 2 for ten periods. The analysis is undertaken to check which of the two policy variables, reserve money growth or nominal debt growth better explains the inflation variability in case of Pakistan after controlling for aggregate demand channel captured by real output gap. The VAR is estimated following the ordering debt growth, reserve money, real output gap and inflation rate. The results suggest that in case of Pakistan, inflation variability is mostly explained by the debt growth (10.92 percent), followed by the reserve money growth (1.16 percent). Canzoneri *et al.* (2001) approach identifies MD regime in Pakistani case. The average percentage of inflation variability explained by debt growth is more than what is explained by reserve money growth suggesting that the type of MD regime seems to be explained by fiscal theory of price level. Baldini and Ribeiro (2008) come up with same findings in case of Ethiopia, Lesotho, Mauritius, Uganda and Zambia where the pass through analysis indicates that inflation variability is more closely associated with nominal debt, while analyzing Sub-Saharan African countries. The results indicate that the forecast error is more explained by shocks in debt growth and suggest that changes in price level are explained by wealth effect of debt growth supporting the prediction of fiscal dominance. However, in case of Pakistan the increase in the domestic debt may be caused by several other factors, exogenous shocks and due to endogenous shocks for example political instability, 2005 earthquake or war on terror etc., causing imbalances in the supply and demand for goods increasing need for government deficit financing increasing domestic debt.

The results of active monetary policy test are reported in Figure 4. The results reject that the monetary authorities acted consistently with MD regime in Pakistani case to accommodate the fiscal shocks. A positive shock in inflation has a negative response on reserve money growth which is consistent with MD regime. In contrast discount rate is responding negatively to a shock is in line with FD regime. These results

seem to indicate that inflation variability could be associated with the changes in the nominal public debt variability (as suggested by pass through results) which could be detrimental to price stability. Zoli (2005) in case of emerging markets come up with mix results for Colombia, Mexico, Thailand and Poland during 1990s and early 2000s. Only in the case of Argentina and Brazil does the evidence point clearly to a regime of fiscal dominance. Baldini and Riberio (2008) find in number of African countries lack of clear monetary or fiscal regime for the period 1980-2005. However some African countries are following strongly fiscal dominant regime, or consistently adopting monetary dominant regime.

#### **Robustness check: Primary Surplus-Domestic Debt Models**

Since both variables primary surplus/GDP  $s$  and primary liabilities/GDP  $w$  are integrated of  $I(1)$ , the following Johansen test results are obtained to investigate the long run cointegration between  $s$  and  $w$  series. According to the trace and maximum eigen value statistics, the hypothesis that there is one cointegration relation is accepted.

The results indicate that that, one percent increase in primary liabilities/GDP lead primary surplus/GDP to increase by 0.12 percent as reported by long run normalized cointegrating relationship in Table 3. On the other hand, since a positive relationship might occur even in non-Ricardian regimes, increasing budget surpluses fail to satisfy continuing increase in primary liabilities especially in economies, where cost of debt increases accordingly; leading intertemporal budget constraint to be satisfied through increases in the price level. Lag length is calculated as 2 by SBC information criteria. At the first VEC, 28% of the short run deviations are corrected in one period, hence, the correction of disequilibrium occurs in 4 periods. According to the second VEC regression results, 25% of the divergence from the equilibrium is corrected in one period; the correction of the short run deviations lasts 4 periods.

According to the long run regression results, one percent increase in primary surplus/GDP lead domestic primary liabilities/GDP to increase by 4.62 percent. As the empirical studies mentioned above suggests, a positive response is expected in Non-Ricardian regimes. In the first

VEC, where  $\Delta w$  is the dependent variable, 3 percent of short run divergence from the equilibrium is corrected in one period; the error correction takes 34 periods. On the other hand, the second VEC results suggest that a 4 percent disequilibrium is corrected within one period and convergence to the long run equilibrium lasts 25 periods.

Now considering inflation-primary liabilities, VEC models are given in Table 4. The long run regression results obtained from VEC estimates are one percentage point increase in primary liabilities leads to 3 percentage point increase in inflation level in Pakistan. VECM estimates suggest that 18% of deviations from the long run equilibrium are corrected within one period, whereas disequilibrium is corrected in 6 periods.

## 5. Conclusion

The present study provides quantitative evidence for the relative importance of fiscal and monetary sources of inflation and traces out the dynamic response of inflation to different shocks, including the nominal public debt. For Pakistan, the evidence is less clear to infer that authorities are following a certain type of regime during the sample period 1960-2009. The liabilities respond negatively to the innovation in surpluses, that is in the subsequent period the liabilities decrease in the face of increase in surplus. This characterizes MD regime, the events that give rise to surplus innovation are likely to persist causing the rise in the future surpluses and surpluses pay-off some of the debt causing the fall in the liabilities. By analyzing the behavior of nominal GDP, an innovation in surplus reduces nominal income and decreases the level of debt in the subsequent periods; this analysis does not confirm the non-Ricardian analysis. On the other hand, the study finds that, as predicted by the fiscal theory of price determination, the occurrence of wealth effects of changes in nominal public debt may pass through to prices by increasing inflation variability in case of Pakistan. In addition, the results show that as predicted by fiscal theory of price determination the discount rate is decreasing in response to positive shock in inflation. The reverse also happens as the reserve money growth also responds negatively as predicted by the MD regime. These findings imply that nominal public liabilities, as reflected either in money growth or in nominal public debt, matter for price stability in case of Pakistan. The

authorities may be following different regimes for different time periods during the 1960-2010.

There are certain limitations of the unrestricted VAR approach. For instance, it does not allow to identify a predominant regime if both FD and MD regimes are alternating during the sample period covered. This may result in having positively correlated surpluses but inconclusive impulse-response analysis. It would be appropriate to apply VAR techniques that allow identifying when regimes are switching [Leeper and Troy (2006) for a general model and for an application to Brazil (Fialho and Portugal, (2005))]. The use of alternate approach of cointegration and error correction model to check the robustness of result further confirm that inflationary behavior in Pakistan is influenced by fiscal dominance, where the impact of the high cost domestic debt on the price level cannot be disregarded. On the other hand, Non-Ricardian policies affect the results of anti-inflationary policies and accessibility of price stability is seriously damaged unless stability policies are backed by fiscal commitment

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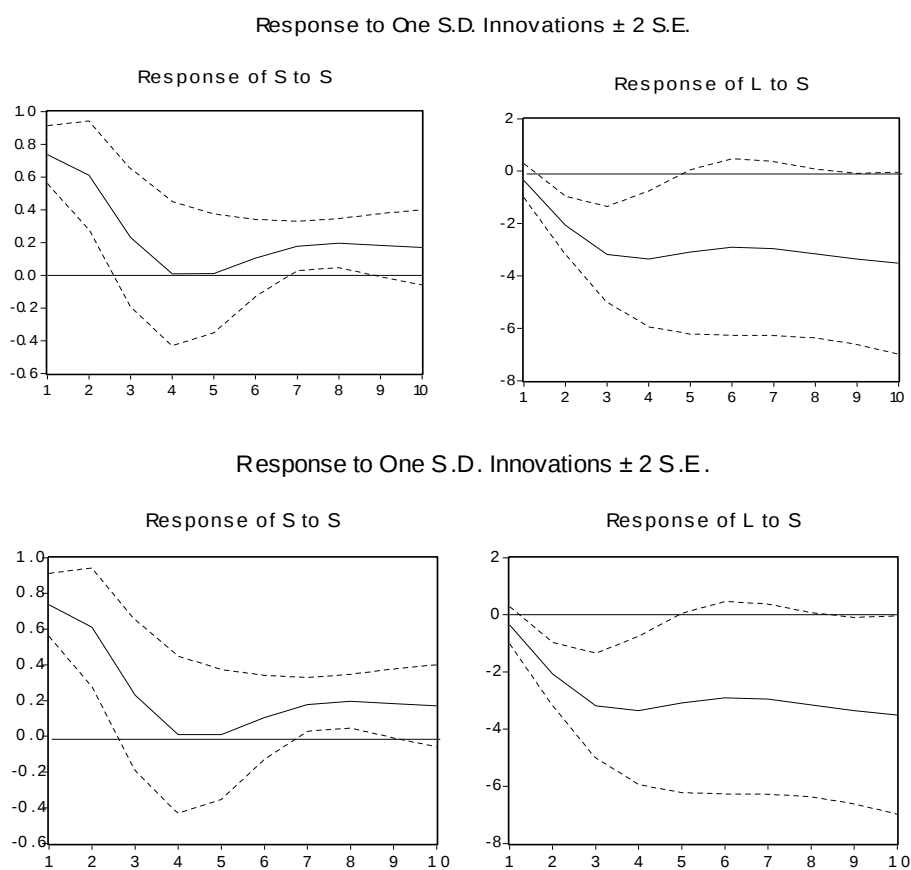
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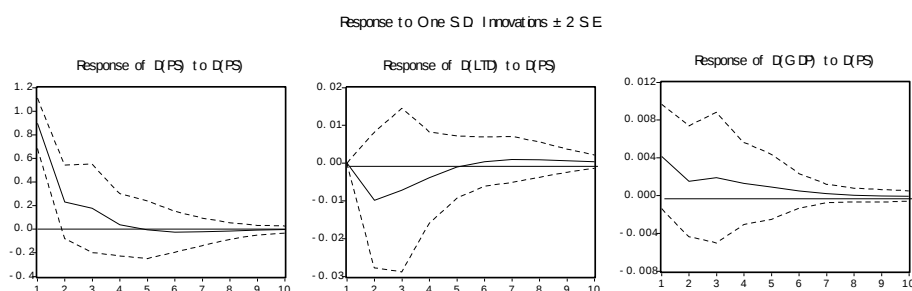
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**Figure 1:** VAR in Surplus to GDP and Liabilities to GDP

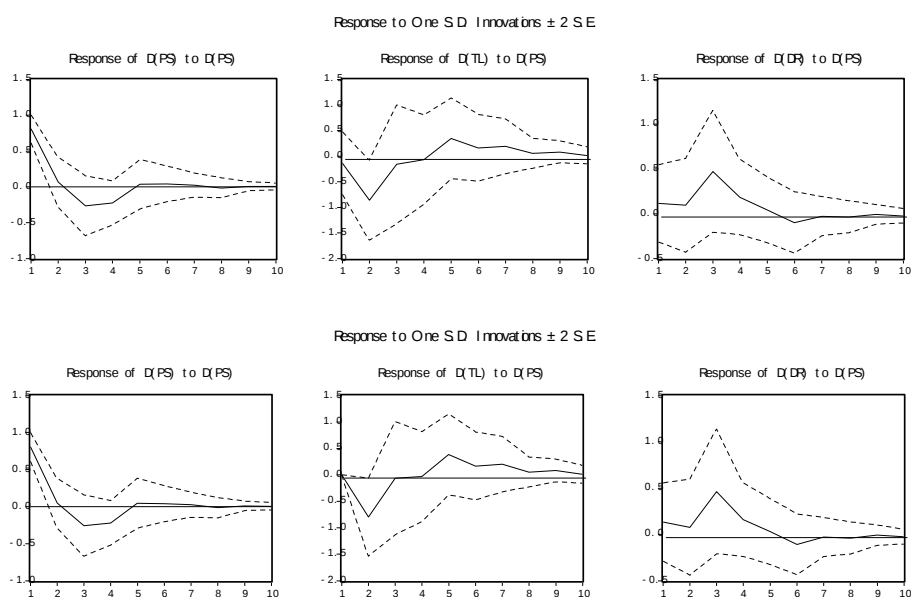
*Note:* The VAR model is estimated with two lags and a constant.

The top panel ordering is Surplus to GDP (S)  $\rightarrow$  Liabilities to GDP (L)

The bottom panel ordering Liabilities to GDP (L)  $\rightarrow$  Surplus to GDP (S).

**Figure 2:** VAR  $\ln(\text{liabilities})$ , Surplus to GDP,  $\ln(\text{GDP})$ 

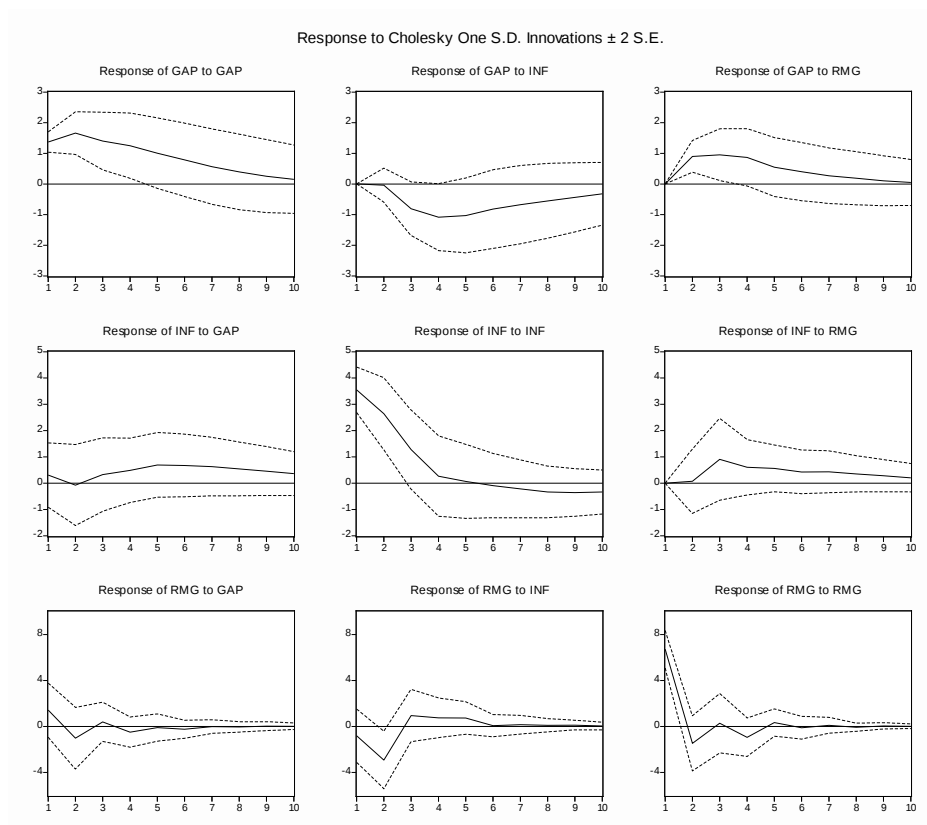
*Note:* The VAR model is estimated with two lags and a constant.  
The causal ordering is  $\ln(\text{Liabilities}) \rightarrow \text{Surplus to GDP} \rightarrow \ln(\text{GDP})$

**Figure 3:** Surplus to GDP, Liabilities to GDP, Discount Rate

*Note:* The VAR model is estimated with two lags and a constant.  
The top panel ordering is  $\text{Surplus to GDP (PS)} \rightarrow \text{Liabilities to GDP (TL)} \rightarrow \text{Discount factor (DF)}$

The bottom panel ordering is  $\text{Liabilities to GDP} \rightarrow \text{Surplus to GDP} \rightarrow \text{Discount factor}$

**Figure 4:** Inflation Responses to Shock in Reserve Money Growth and Domestic Public Debt



*Note:* The VAR for causal ordering Output Gap (GAP)→inflation (INF)→Reserve money growth RMG) (or Discount Rate) with two and a constant.

**Table 1:** Autocorrelation of Primary Surplus/GDP

| Lag | Autocorrelatio | Q-Stat | P-value |
|-----|----------------|--------|---------|
| 1   | 0.73           | 21.75  | 0.00    |
| 2   | 0.50           | 32.31  | 0.00    |
| 3   | 0.37           | 38.16  | 0.00    |
| 4   | 0.35           | 43.78  | 0.00    |
| 5   | 0.41           | 51.67  | 0.00    |
| 6   | 0.37           | 58.21  | 0.00    |
| 7   | 0.35           | 64.34  | 0.00    |
| 8   | 0.33           | 69.78  | 0.00    |
| 9   | 0.28           | 73.85  | 0.00    |
| 10  | 0.25           | 77.31  | 0.00    |
| 11  | 0.15           | 78.52  | 0.00    |
| 12  | 0.08           | 78.87  | 0.00    |
| 13  | 0.02           | 78.89  | 0.00    |
| 14  | -0.01          | 78.89  | 0.00    |
| 15  | -0.02          | 78.91  | 0.00    |
| 16  | -0.07          | 79.27  | 0.00    |

**Table 2:** Variance Decomposition of INF

| Variance Decomposition of INF:    |          |          |          |          |          |
|-----------------------------------|----------|----------|----------|----------|----------|
| Period                            | S.E.     | TD       | RMG      | GAP      | INF      |
| 1                                 | 3.622000 | 2.828269 | 6.410895 | 0.036414 | 90.72442 |
| 2                                 | 4.557845 | 8.129574 | 5.995868 | 0.856532 | 85.01803 |
| 3                                 | 4.773789 | 9.085645 | 5.929916 | 0.787413 | 84.19703 |
| 4                                 | 4.848207 | 11.10081 | 6.402905 | 0.833709 | 81.66257 |
| 5                                 | 4.905158 | 11.94281 | 6.857647 | 1.317685 | 79.88186 |
| 6                                 | 4.966387 | 12.95595 | 7.125952 | 1.568167 | 78.34993 |
| 7                                 | 5.017416 | 13.57980 | 7.360034 | 1.698986 | 77.36118 |
| 8                                 | 5.056073 | 13.99127 | 7.446559 | 1.703622 | 76.85855 |
| 9                                 | 5.076649 | 14.17347 | 7.443538 | 1.690049 | 76.69294 |
| 10                                | 5.085825 | 14.23960 | 7.417234 | 1.728435 | 76.61473 |
| Cholesky Ordering: TD RMG GAP INF |          |          |          |          |          |
|                                   |          |          |          |          |          |

**Table 3a:** Johansen Co-integration Test Results between w and s

| Null Hypothesis | Trace Statistics | 5% Critical Value | Prob  | Maximal Eigen Value Statistics | 5% Critical Value | Prob |
|-----------------|------------------|-------------------|-------|--------------------------------|-------------------|------|
| $0=r$           | 21.34*           | 15.49             | 0.005 | 21.22*                         | 15.89             | 0.02 |
| $1 \leq r$      | 0.11             | 3.84              | 0.73  | 6.47                           | 9.16              | 0.16 |
|                 |                  |                   |       |                                |                   |      |

Note: Both tests indicate no co-integration at 5 percent level.

**Table 3b:** Johansen Co-integration Test Results between PL and PS

| Null Hypothesis | Trace Statistics | 5% Critical Value | Prob  | Maximal Eigen Value Statistics | 5% Critical Value | Prob |
|-----------------|------------------|-------------------|-------|--------------------------------|-------------------|------|
| $0=r$           | 21.34*           | 15.49             | 0.005 | 18.25*                         | 13.80             | 0.02 |
| $1 \leq r$      | 0.11             | 3.84              | 0.73  | 6.47                           | 9.16              | 0.16 |
|                 |                  |                   |       |                                |                   |      |

Notes for the above tables: The \* indicates the number of co integrating equations corresponding to that row of the Table// Both the tests show that there is one co-integrating vector at 5 percent level Two lags included in the vector auto regressions are determined using the Swartz Basian Creteria.

**Table 3c:** Results of Primary Surplus Feedback

**Long run relationship:**  $s_t = 0.03 + 0.12 \cdot w_t$

**Short Run relationship and error adjustment**

|            | EC                 | $\Delta s$         | $\Delta w$         | D(PL(-1))          | D(LIBOR(-2))      |
|------------|--------------------|--------------------|--------------------|--------------------|-------------------|
| $\Delta s$ | -0.25<br>[-1.369]  | 0.214<br>[1.784]   | -0.378<br>[-3.444] | -0.170<br>[-4.562] | 0.109<br>[2.231]  |
| $\Delta w$ | -1.554<br>[-3.384] | -1.088<br>[-1.458] | 0.087<br>[ 0.621]  | 0.386<br>[ 5.705]  | 0.126<br>[ 1.855] |

### Results of Primary Surplus Feedback

Long run relationship:  $w_t = 0.47 + 4.62 \cdot s_t$

Short Run relationship and error adjustment

|            | EC               | $\Delta w$       | $\Delta w$       | S                | D(LIBOR(-2))     |
|------------|------------------|------------------|------------------|------------------|------------------|
| $\Delta w$ | -0.07<br>[-3.34] | -0.16<br>[0.07]  | -0.49<br>[-1.77] | -1.08<br>[-1.45] | 0.01<br>[0.02]   |
| $\Delta s$ | 0.05<br>[ 1.36]  | -0.17<br>[-4.50] | -0.10<br>[-2.32] | 0.21<br>[ 1.74]  | -0.37<br>[-3.44] |

**Table 4a:** Johansen Co-integration Test Results between INF and PL

| Null Hypothesis | Trace Statistics | 5% Critical Value | Prob | Maximal Eigen Value Statistics | 5% Critical Value | Prob |
|-----------------|------------------|-------------------|------|--------------------------------|-------------------|------|
| $0=r$           | 17.02*           | 15.49             | 0.02 | 14.28*                         | 15.89             | 0.02 |
| $1 \leq r$      | 3.24             | 3.84              | 0.07 | 6.47                           | 9.16              | 0.16 |
|                 |                  |                   |      |                                |                   |      |

Notes for the above tables: The \* indicates the number of co integrating equations corresponding to that row of the Table// Both the tests show that there is one co-integrating vector at 5 percent level Two lags included in the vector auto regressions are determined using the Swartz Basian Creteria.

**Table 4b:** Inflationary Effect of Primary Liabilities

Long run relationship  $\text{Inf} = 0.01 + 0.03 \cdot w$

|                     | EC               | $\Delta w$       | $\Delta w$       | S               | D(LIBOR(-2))   |
|---------------------|------------------|------------------|------------------|-----------------|----------------|
| $\Delta \text{inf}$ | -0.18<br>[-3.88] | 0.11<br>[0.64]   | -0.01<br>[-1.49] | 0.01<br>[0.94]  | 0.08<br>[1.40] |
| $\Delta w$          | 0.05<br>[ 0.31]  | -0.35<br>[-0.78] | 0.54<br>[3.34]   | 0.71<br>[ 2.20] | 0.54<br>[3.34] |

|                     | EC                | $\Delta \text{INF}$ | $\Delta w$        |
|---------------------|-------------------|---------------------|-------------------|
| $\Delta \text{INF}$ | -0.16<br>(-2.46)  | 0.07<br>[1.78]      | 0.19<br>[-1.19]   |
| $\Delta w$          | -0.40<br>[ -1.64] | -0.01<br>[-1.45]    | -0.08<br>[ -0.05] |

## **Testing the Theoretical Proposition of Exchange Market Pressure: The Nigerian Experience**

Jimoh Olajide Raji, Juzhar Jusoh and Mohd-Dan Jantan<sup>1</sup>

In this paper, monetary model of Exchange Market Pressure (EMP) is applied to Nigerian economy over the period 1970 to 2010. In support of the EMP propositions, dynamic ordinary least squares (DOLS) results reveal that domestic credit has stable significant negative relationship with exchange market pressure. The findings also provide evidence that Nigerian monetary authorities absorbed most of the exchange market pressure by adjusting the foreign reserves. The overall results indicate that the Nigeria's experience provides another good example to test the theoretical propositions of the Girton-Roper monetary model of exchange market pressure.

### **1. Introduction**

The Bretton Woods system known as the international monetary regime existed from the end of World War II until the early 1970s. Under the Bretton Woods system, all the member countries consented to tie their currency to US dollar and to peg their exchange rates. These countries also agreed to purchase and sell U.S. dollars in order to maintain their currencies within 1% of the fixed rate (Strange, 1976). In addition, these countries had right to alter their par value when necessary and in line with agreed procedures to correct basic external imbalances. The central banks of countries other than the United States did this by intervening in foreign exchange markets. If a country's currency was too high relative to the dollar, its central bank would sell its currency in exchange for dollars, driving down the value of its currency. Conversely, if the value of a country's money was too low, the country would buy its own currency, thereby driving up the price. The economic implication of maintaining currencies within 1% of fixed rate is to avoid excessive

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depreciation or appreciation against US dollar. Thus, countries with large trade surpluses often sell their own currencies in an effort to prevent them from appreciating and thereby hurting exports. On the other hand, countries with large deficits often buy their own currencies in order to prevent depreciation, which raises domestic prices. This intervention has limit especially for countries with large trade deficits. A country that intervenes to support its currency may deplete its foreign reserves. Such country will not be able to further its support for the currency and leaves it with its inability to meet its international obligations.

During this period when exchange rates were fixed, researchers focused their attentions on the influencing factors of a country's balance of payment. This approach is known as the monetary approach to balance of payment.

The monetary approach to balance of payment has emerged since 1950s after reviving the formal view of Hume (1752) on the theory. The works of Polak (1957), Hahn (1959), Mundell (1968) and Dornbush (1973) became the sources. Centre to this approach is the assertion that "the balance of payment is essentially a monetary phenomenon" (Frenkel and Johnson, 1977:21). Under this approach, any excess demand for goods, services and assets or securities, resulting in a deficit of the balance of payment, reflects an excess supply of the stock of money. In analyzing the money account, the monetary approach focuses on the determinants of the excess domestic flow demand for or supply of money (Frenkel and Johnson, 1977).

The year 1971 witnessed the collapse of Bretton Woods system due to inflation and increasing trade deficit of the United States that were making the value of the dollar to be less strong and secured (Strange, 1976). Following the end of the Bretton Woods system, member countries have been allowed to operate freely floating exchange rates system. By 1973, majority of the world strong economies had left their currencies against the dollar to float freely. The transition was a rocky type, characterized by plummeting stock prices, skyrocketing oil prices (following the Middle East crisis), bank failures and inflation (James, 1996).

During this period of floating exchange rates system, attentions of researchers were directed towards finding out the determinants of exchange rates. This approach is known as monetary approach to the exchange rate determination. The monetary approach to the exchange rate determination deals with the explanation of the impact of domestic money market disequilibrium on the exchange rate where the economy is operating a fully flexible system of exchange rate (Frenkel, 1976). The main essential points expressed by the monetary approach to the exchange rate determination according to Caves and Feige (1980) is the claim that the distortion in the rate of exchange is to a greater extent explained by changes in the relative money supplies of the countries. Therefore, the monetary approach suggested that the supply of money could play a useful role in forecasting the rates of exchange. This implies that exchange rates variation has causal relation to the change in money supply.

In another development, Girton and Roper (1977) introduced a new monetary model of exchange market pressure (EMP). The model is based on the monetary approach to the Balance of Payments and a monetary approach to the exchange rates determination. According to the monetary model of exchange market pressure, the imbalances in external sector brought about by the difference in domestic demand and supply of money can be corrected by either adjusting exchange rates or international reserves or the two means simultaneously.

The current study applies monetary model of EMP of Lance Girton and Don Roper to monetary experience in Nigeria over the period 1970-2010. This period has witnessed shifts from one regime of exchange rate to another. For example, Nigerian monetary authorities in 1986 changed from fixed exchange rate system which was in operation since 1960 to floating exchange rate regime and this continued until 1994 when exchange rate was again fixed at 22 Naira per US dollar (Nigeria Deposit Insurance Cooperation, NDIC, 1994). Coincidentally, this fixed rate was the same rate as the prevailing rate determined by the exchange rate market. In 1995, autonomous foreign exchange market was introduced but the Central Bank of Nigeria (CBN) could intervene where necessary (Jimoh, 2004). To ensure a competitive economy performance, the exchange rate was completely left for market determination in 1996 (NDIC, 1996). With this development, Nigeria

has been fully operating floating exchange rate system from 1996 till date while the deficit in balance of payment still persists.

The EMP model has been tested by some studies in various developed and developing countries to determine its sensitivity and to determine how an economy absorbs external imbalances. For example, studies that have applied the EMP model include the study of Girton and Roper (1977) for Canada, Connolly and da Silveria (1979) for Brazil, Modeste (1981) for Argentina, Kim (1985) and Mah (1991, 1995) for Korean, Thornton (1995) for Costa Rica, Parlaktuna (2005) for Turkey, Bielecki (2005) for Poland, Gharthey (2002) for Jamaica and Gharthey (2005) for Ghana. Nigeria is a small economy opened to the rest of the world and accepts world prices and monetary conditions as given. In spite of this fact, EMP model has not been applied to its data to test the model's proposition and to determine the sources by which the country absorbs exchange market pressure or overall balance of payment disequilibrium. Closing this gap is an important motivation for this study.

Although Jimoh (2004) examined how relevant was the monetary approach to a floating exchange rate in Nigeria over the period 1987 to 2001, yet he did not actually apply monetary model of EMP which encompasses both exchange rate and foreign reserves as its components. The current study therefore, attempts to apply the monetary model of EMP to Nigeria data as Nigeria's experience will contribute to the existing literature in this field. Paying attention to EMP instead of emphasizing the amount of exchange rate variation according to IMF is practically relevant, as 82% of the currencies in the world are being either fixed, freely float or managed float (IMF, 2009).

In consideration of the above arguments, this paper intends to test the theoretical propositions of EMP in the context of Nigeria and determine the main means by which the exchange market pressure or external imbalance is absorbed by the monetary authorities in Nigeria.

The rest sections of the paper are as follows: section 2 is about the monetary model of EMP. In section 3, the methodology and data are discussed while the interpretation of empirical findings is done in section 4. The last section deals with the study's conclusion.

## **2. The Monetary Model of Exchange Market Pressure**

The exchange rate and balance of payment theories focus on tensions in the foreign exchange market under floating or fixed rates. Girton-Roper defined EMP as the endogenous variable of net foreign assets (or international reserves) and exchange rates changes which absorb the pressure exerted by the excess increase in the supply of money over its demand, given a freely, fixed, or managed floating exchange rate system.

The basis of the EMP model is that any domestic supply of money in excess of demand can be normalized by depreciation of exchange rate (domestic currency) or by losing international reserves or by the two means simultaneously in an economy with managed flexible system of exchange rate. Similarly, any domestic demand for money in excess of its supply can be corrected by the appreciation of exchange rate (domestic currency) or by gaining international reserves, or by the two means simultaneously in an economy with managed flexible system of exchange rate. In a fully fixed exchange rate system, there is no variation in exchange rate and so, changes in the net international reserve serve as the medium of adjustment to make demand for money equal to supply of money. This implies that any domestic supply of money in excess of its demand can be normalized by losing international reserves. In this case, the EMP is absorbed by loss of reserves. In a fully floating exchange rate system on the other hand, there is no variation in international reserves and so, variations in the net exchange rates serve as a medium of adjustment to make demand for money equal to supply of money. This means that any domestic supply of money in excess of demand can be normalized by depreciation of exchange rate (domestic currency). In this case, the EMP is absorbed by domestic currency depreciation (Parlaktuna, 2005; Pilbeam, 1998; Salvatore, 2001). The above analysis makes the monetary model of EMP to be applicable to all spectrums of exchange rate regime (Henk and Klaassen, 2010).

The adjustment to equilibrium of any disturbance caused by the determinants of demand and/or supply of money is emphasized by the monetary model of EMP based on the monetary approach to balance of payments and a monetary approach to the exchange rates determination. The monetary model of EMP is formulated from the money demand function, money supply function and from purchasing power parity

(Connolly and da Silveria, 1979; Gharvey 2002, 2005; Kim, 1985; Mah, 1991, 1995; Modeste, 1981; Parlaktuna, 2005; Thornton, 1995). The money demand function is given in equation (1) as:

$$M^D = k.DP.RY.IR \quad (1)$$

Where  $M^D$  is the money demand, DP is the domestic price level (consumer price index), RY is the real income (real gross domestic product), IR is the nominal interest rate and k is a constant, expressing the proportion of real income preferred to be held as cash balance by individual. In the studies for Canada, nominal interest rate was included in the money demand function by Girton and Roper (1977) and Weymark (1995, 1997). Therefore, nominal interest rate has been included in the money demand function. Under the presumption of a small country, the purchasing power parity (PPP) holds and expresses the ratio of domestic price level (DP) to the world price level (WP) via the nominal exchange rate (EX). The expression is given in equation (2).

$$EX = DP/WP \quad (2)$$

From equation (2), DP is made the subject of formula and is substituted in the money demand function (1) to get

$$M^D = k .EX .WP.RY.IR \quad (3)$$

The money supply function following Mundell (1971) is given in equation (4) where  $M^S$  is the domestic money supply, FV is the international asset, and DC is the domestic credit or domestic asset. The money multiplier is constant and taken to be unity. The equation (4) is a process of money supply which comprises variation in international reserves through the balance of payment and a variation in domestic credit through the banking system.

$$M^S = FV + DC \quad (4)$$

At equilibrium, change in domestic money demand  $\Delta M^D$  must equal change in domestic money supply  $\Delta M^S$  as given in equation (5).

$$M^D = M^S \quad (5)$$

By substituting equations (3) and (4) into equation (5), taking logarithm, differentiating the expression and expressing the outcome in the form of percentage changes gives equation (6).

$$\Delta \ln FV - \Delta \ln EX = -\beta_1 \Delta \ln DC + \beta_2 \Delta \ln WP + \beta_3 \Delta \ln RY + \beta_4 \Delta \ln IR \quad (6)$$

Equation (6) is a fundamental equation of EMP to test the hypotheses that: one, domestic credit (DC) is expected to be negative such that an increase in the domestic credit growth rate will lead to a proportional loss of international reserves (FV) and/or exchange rate (EX) increase (depreciation); two, world price (WP) is expected to be positive such that when the world price increases, it will lead to proportional gain of international reserves and/or exchange rate decrease (appreciation); three, we expect interest rate (IR) to carry a negative sign such that an increase in it will lead to a depletion of international reserves (FV) and/or exchange rate (EX) depreciation; and finally, real income (RY) is expected to be positive such that when the real income increases, it will cause a proportional appreciation of domestic currency and/or international reserves inflow. In addition, Fleming (1962), Mundell (1963) and Obstfeld (2001) have argued that where there is perfect capital mobility, any rise in the real income has the tendency of causing demand for money to rise. As a result, interest rate will increase thereby leading to an inflow of foreign assets and appreciation of domestic currency.

In order to test how sensitive is the measure of EMP to changes in exchange rate and foreign reserve, and to verify the means by which the pressure is absorbed by change in each of these constituent variables of EMP, Girton and Roper (1977) added the ratio of exchange rate to foreign reserve (EX/FV) to EMP equation. However, Connolly and da Silveira (1979) observe that this is appropriate where there is no discontinuity in (EX/FV) such that there is no frequent change of surplus to deficit and deficit to surplus during the study period. They point out that where there is discontinuity,  $S = (EX-1)/(FV-1)$  is the appropriate variable to use. Since there is discontinuity in the case of Nigeria, this study follows Connolly and da Silveira (1979), Ghartey (2005), and Parlaktuna (2005), and by adding variable S to the EMP equation (6), the resulting expression is given in the equation (7).

$$\Delta \ln FV - \Delta \ln EX = -\beta_1 \Delta \ln DC + \beta_2 \Delta \ln WP + \beta_3 \Delta \ln RY + \beta_4 \Delta \ln IR + \beta_5 S \dots \quad (7)$$

From the results obtained in equation (7), one can conclude that there is no discrimination in the absorption of exchange pressure if the parameter estimate of variable S is not significant and the estimated results of other exogenous variables (DC, WP, RY and IR) are left unaltered as in EMP equation (6). This implies that EMP is insensitive to its constituent variables. Hence, the amount of intervention needed to realize a targeted exchange rate by the monetary authorities can be determined by using both reserves and domestic currency depreciation (Connolly and da Silveira, 1979; Ghartey, 2005; Girton and Roper, 1977; Parlaktuna, 2005; Stavarek, 2007). Suppose the parameter estimate of variable S is positively significant while the results of (DC, WP, RY and IR) remain the same with EMP result, it means that exchange pressure is absorbed by forfeiting international reserves only. On the other hand, if the parameter estimate of variable S is negatively significant while the results of (DC, WP, RY and IR) remain the same with EMP result, then domestic currency depreciation is used to absorb the exchange pressure, *ceteris paribus* (Ghartey, 2005; Parlaktuna, 2005; Stavarek, 2007).

In order to test the efficiency of EMP and verify the true endogenous variable, the composition of EMP is split into foreign reserves and exchange rate, and each of them separately serves as a dependent variable to the explanatory variables of the EMP equation. The international reserves (or balance of payments) and exchange rate equation using the EMP exogenous variables are specified in equation (8) and (9) respectively.

$$\Delta \ln FV = -\beta_1 \Delta \ln DC + \beta_2 \Delta \ln WP + \beta_3 \Delta \ln RY + \beta_4 \Delta \ln IR \quad (8)$$

$$\Delta \ln EX = -\beta_1 \Delta \ln DC + \beta_2 \Delta \ln WP + \beta_3 \Delta \ln RY + \beta_4 \Delta \ln IR \quad (9)$$

Each of the equation is estimated and the endogenous variable between the two whose results give better estimates is taken to have borne the brunt of absorbing the external imbalances or exchange market pressure. The results obtained are to confirm those obtained from EMP equation (6) for the efficiency sake.

### 3. Methodology and Data

Unit root and stationarity tests are conducted using Augmented Dicky-Fuller (1981). This is important because the properties and behaviour of a series can highly be influenced by the stationarity or non-stationarity of a series in which case, 'shocks' to the system will wipe away gradually from one period to another in the case of a stationary series as compared with non-stationary series where the shocks will be continuous indefinitely (Brooks, 2008).

To estimate the monetary model of Exchange Market Pressure, the current study employs the leads and lags regression of Stock and Watson (1993), otherwise known as dynamic ordinary least squares (DOLS) regression. The leads and lags regression has the fundamental objective of obtaining efficient parameter estimates with normal distribution (Choi and Kurozumi 2008). The technique of DOLS solves the problems associated with endogeneity and biasness associated with small sample, thus making the estimates to be robust (Stock and Watson, 1993). In addition, DOLS regression employs Newey-West estimator in order to further address the likely problem of autocorrelation and heteroscedasticity associated with the model's error terms overtime. By employing the estimator procedure it corrects the standard errors of the parameter estimates to achieve its robustness (Newey and West, 1987).

The study employed annual time series data over the period 1970 to 2010. Data on the world price (US consumer price index) were collected from World Bank Development Indicators. Data on real income (gross domestic product), domestic credit, exchange rate and foreign reserves were sourced from the Central Bank of Nigeria statistical bulletin.

### 4. Empirical Results

Before the estimation of the models, analysis of the data was done by conducting the Augmented Dickey Fuller (ADF) tests on domestic credit (DC), world inflation measured by the U.S consumer price index (WP), real income (RY), foreign reserves (FV), exchange rate (EX), and exchange market pressure, EMP (EX + FV). The results of the unit root test presented in Table 1 accept the null hypothesis of presence of unit root at level for all the variables except WP with the constant/trends model, FV and EMP with the two types of model (constant; and constant/trends). These variables which are stationary at level have their

ADF test statistics more than the 1%, 5% and 10% critical value. Other variables (DC, WP, RY, IR and EX) which were non-stationary at level were differenced once and they became stationary, thus rejecting the null hypothesis of presence of unit root.

**Table 1:** Results of the unit roots tests (ADF statistics)

| Variable | Model Types     | ADF Statistics<br>(At Level) | ADF Statistics<br>(First difference) | Order |
|----------|-----------------|------------------------------|--------------------------------------|-------|
| DC       | Constant        | 1.60                         | 4.97***                              | I(1)  |
|          | Constant/trends | 0.04                         | 5.03***                              | I(1)  |
| WP       | Constant        | -2.03                        | -5.16***                             | I(1)  |
|          | Constant/trends | -4.30***                     | -                                    | I(0)  |
| RY       | Constant        | 1.97                         | -5.30***                             | I(1)  |
|          | Constant/trends | -0.46                        | -5.83***                             | I(1)  |
| IR       | Constant        | -1.47                        | -9.92***                             | I(1)  |
|          | Constant/trends | -1.57                        | -9.84***                             | I(1)  |
| FV       | Constant        | 14.69***                     | -                                    | I(0)  |
|          | Constant/trends | 15.81***                     | -                                    | I(0)  |
| EX       | Constant        | 0.55                         | -5.78***                             | I(1)  |
|          | Constant/trends | -1.48                        | -6.07***                             | I(1)  |
| EMP      | Constant        | -5.55***                     | -                                    | I(0)  |
|          | Constant/trends | -5.49***                     | -                                    | I(0)  |

Note: \*\*\* represents 1% level of significance

The fundamental Exchange Market Pressure equation (6) given as EMP ( $\Delta \ln FV + \Delta \ln EX$ ) can be represented in equation (10) using DOLS approach as

$$\begin{aligned}
 EMP_t = & \beta_0 + \beta_1 \ln DC_t + \beta_2 \Delta \ln DC_t + \beta_3 \Delta \ln DC_{t+1} + \beta_4 \Delta \ln DC_{t-1} \\
 & + \beta_5 \ln WP_t + \beta_6 \Delta \ln WP_t + \beta_7 \Delta \ln WP_{t+1} + \beta_8 \Delta \ln WP_{t-1} \\
 & + \beta_9 \ln RY_t + \beta_{10} \Delta \ln RY_t + \beta_{11} \Delta \ln RY_{t+1} + \beta_{12} \Delta \ln RY_{t-1} \\
 & + \beta_{13} \ln IR_t + \beta_{14} \Delta \ln IR_t + \beta_{15} \Delta \ln IR_{t+1} + \beta_{16} \Delta \ln IR_{t-1} + u_t
 \end{aligned} \tag{10}$$

By following Stock and Watson (1993), an arbitrary leads and lags are chosen. This is followed by adding the first difference of independent variables, lead of the first difference of the independent variables and lag of the first difference of the independent variables as specified in the equation (10). The  $\beta$  is the respective coefficient,  $\Delta$  is the first difference operator, and  $\ln$  is the natural logarithm. In order to give room for the interpretation of the parameters estimates as elasticities (Brooks 2008;

Gawronka-Nowak and Grobowski, 2011), all the variables (expressed as percentage changes) have also been expressed in natural logarithm. The results of estimation of EMP equation (10) are presented in Table 2.

The results show that the domestic credit has the expected negative sign with its coefficient not different from unity and is statistically significant at 1% level. This evidence is in line with the proposition of monetary model of exchange market pressure. It also supports the monetary argument that excess increase in money supply resulting from excess increase in domestic credit causes the Nigerian reserves to continually decrease and/or the country's currency (*Naira*) to depreciate in value. Given that all other things are constant, a rise in the growth of domestic credit causes an outflow of Nigerian foreign reserves and depreciation in domestic currency. For example, with the coefficient of DC being -2.85, it means that an increase in domestic credit by 10% results in foreign reserves outflow by 28.5% or exchange rate depreciation by 28.5% or by proportion of the two simultaneously.

**Table 2:** DOLS results of exchange market pressure

| Variable    | Coefficient | Std. Error | t-Statistic | Prob.   |
|-------------|-------------|------------|-------------|---------|
| C           | 0.62        | 0.26       | 2.34        | 0.03**  |
| D_LDC       | -2.85       | 0.67       | -4.23       | 0.00*** |
| D_LWP       | 0.51        | 0.30       | 1.69        | 0.11    |
| D_LRY       | -1.81       | 0.77       | -2.33       | 0.03**  |
| D_LIR       | -0.68       | 1.19       | -0.56       | 0.57    |
| D_D_LDC     | 1.30        | 0.43       | 2.97        | 0.01**  |
| D_D_LDC(1)  | -0.57       | 0.21       | -2.62       | 0.02**  |
| D_D_LDC(-1) | 0.79        | 0.47       | 1.66        | 0.12    |
| D_D_LWP     | -0.14       | 0.55       | -0.25       | 0.80    |
| D_D_LWP(1)  | 0.89        | 0.52       | 1.69        | 0.11    |
| D_D_LWP(-1) | -0.64       | 0.73       | -0.86       | 0.40    |
| D_D_LRY     | 1.15        | 0.51       | 2.24        | 0.04**  |
| D_D_LRY(1)  | -0.11       | 0.18       | -0.65       | 0.52    |
| D_D_LRY(-1) | 0.72        | 0.34       | 2.12        | 0.05**  |
| D_D_LIR     | -0.84       | 0.96       | -0.87       | 0.39    |
| D_D_LIR(1)  | -1.10       | 0.88       | -1.24       | 0.23    |
| D_D_LR(-1)  | -0.56       | 0.66       | -0.84       | 0.41    |

Note: All variables are in natural logarithm (L). \*\* and \*\*\* represent 5% and 1% level of significance respectively

This has important implication for the Nigerian monetary authorities in the sense that it determines the level of their independence. Attempt to increase the grow rate of domestic credit calls for the readiness to lose foreign reserve or depreciate the domestic currency. The result of the first test obtained with respect to domestic credit is similar to those gotten in the similar studies by Burdekin and Bukell (1990), and Girton and Roper (1977) for Canada, Connolly and da Silveira (1979) for Brazil, Parlaktuna (2005) for Turkey, Ghartey (2002) for Jamaica, Ghartey (2005) for Ghana, and Kemme and Lyakir (2009) for Czech Republic.

From the results table, world price and interest rate maintain their positive and negative signs respectively. However, they are not significant in influencing EMP. In these cases, the propositions of exchange market pressure model are not supported by these tests. By comparison, these results contradict the findings of previous studies (Connolly and da Silveira, 1979; Girton and Roper, 1977; Kim, 1985; Parlaktuna, 2005; Ghartey, 2002, 2005; Panday, 2011). This may be due to the inclusion of interest rate in the model which some previous studies (Connolly and da Silveira, 1979; Ghartey, 2002, 2005; Modeste, 1981; Thornton, 1995) argue could lead to a problem of simultaneous equation bias in the EMP model. This is possible according to these authors particularly if the monetary decision making body decides to vary domestic credit to pay for changes in international reserve or net foreign assets.

The EMP results indicate that real income is negatively signed. This test's result is in contrary to the proposition of the EMP model that real income is expected to be positive such that when the real income increases, it will cause a proportional appreciation of domestic currency and/or international reserves inflow. The impact of real income on EMP in Nigeria is negative and statistically significant at 5% level and its coefficient is not different from unity as hypothesized. This implies that a 1% increase in the real income causes almost a 2% domestic currency depreciation and/ or the international reserves deterioration. Studies of EMP measurement which have obtained negative values for the coefficient of real income include Ghartey (2002, 2005) for Jamaica and Ghana respectively, Garcia and Malet (2007) for Argentina, Obstfeld (1982) for West Germany, and Panday (2011) for Nepal.

Plausible explanation could be given in the case of Nigeria for the negative relationship of real income with EMP. For instance, when there is increase in real income, demand for money increases and as a result, aggregate demand for both domestic and foreign goods and services increases. The demand for foreign goods and services requires foreign currency. Therefore, the pressure on foreign currency depreciates the domestic currency. On the other hand, as the demand for money increases due to increase in real income, the aggregate demand for both foreign and domestic good and services increases. Consequently, adjustment is needed to bring money demand equal to money supply through the international reserves adjustment. In this process, the monetary authorities buy domestic currency and the international reserves, money demand and aggregate demand begin to fall in that order.

DOLS regression employs Newey-West estimator in order to further address the likely problem of autocorrelation and heteroscedasticity associated with the model's error terms. The estimator corrects the presence of correlation and heteroscedasticity effects in the error terms of the time series regression overtime (Newey and West, 1987). As suggested by Stock and Watson (1993), chi-square is used for making inferences following the DOLS regression. In the Table 3, the results of the residual diagnostic test show that the null hypothesis of no autocorrelation and that there is absence of ARCH (Heteroscedasticity) cannot be rejected since their p-values are greater than 5% level of significance. The residual also displays that its behaviour is non linear as the RESET test (with the use of square of fitted values) indicates a p-value exceeding 5% level of significance. The functional form therefore confirms the right specification of the model. Lastly, Jarque-Bera test of normality also indicates that the residuals are normally distributed since the p-value is greater than 5% level of significance.

**Table 3:** Results of residual diagnostic test of EMP model

|                                    | Obs*R-squared | Prob. Chi-Square | Order |
|------------------------------------|---------------|------------------|-------|
| Breusch-Godfrey Serial Correlation | 3.41          | 0.06             | 1     |
| Heteroscedasticity Test: ARCH      | 0.84          | 0.65             | 2     |
| Ramsey RESET Test                  | 0.58          | 0.31             | 1     |
| Jarque-Bera Normality Test         | 0.75          | 0.68             |       |

Figure 1 shows the explanatory power of the monetary model of exchange market pressure (EMP). Comparison is made between the actual movement and the predicted movement in dependent variable, EMP which composes the summation of the rate of EX and the change in FV. As shown by the Figure 1, the prediction of the model appears reasonable as the predicted values or movements have better reflection of the actual values. It can also be observed that the fitted values closely track down the movement of the actual values.

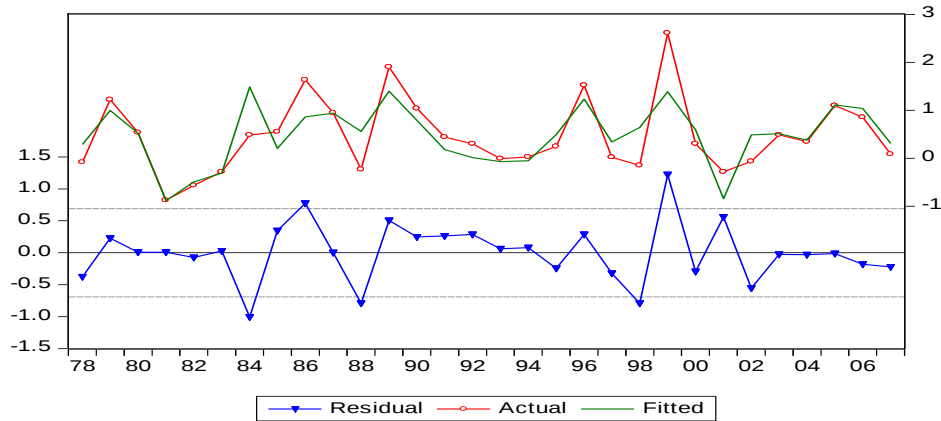


Figure 1: Actual and fitted exchange market pressure

In order to determine the main means by which the exchange market pressure is absorbed by the Nigerian monetary authorities, S variable is included in the explanatory variables of EMP model (10) and this gives equation (11).

$$\begin{aligned}
 EMP_t = & \beta_0 + \beta_1 S_t + \beta_2 \ln DC_t + \beta_3 \Delta \ln DC_t + \beta_4 \Delta \ln DC_{t+1} + \beta_5 \Delta \ln DC_{t-1} \\
 & + \beta_6 \ln WP_t + \beta_7 \Delta \ln WP_t + \beta_8 \Delta \ln WP_{t+1} + \beta_9 \Delta \ln WP_{t-1} \\
 & + \beta_{10} \ln RY_t + \beta_{11} \Delta \ln RY_t + \beta_{12} \Delta \ln RY_{t+1} + \beta_{13} \Delta \ln RY_{t-1}
 \end{aligned}$$

$$+ \beta_{14}\ln IR_t + \beta_{15}\Delta \ln IR_t + \beta_{16}\Delta \ln IR_{t+1} + \beta_{17}\Delta \ln IR_{t-1} + u_t \quad (11)$$

This process also tests how sensitive is the measure of EMP to changes in exchange rate and foreign reserves changes. The results of the estimation as shown by Table 4 imply that there is no discrimination (no choice is made between EX and FV) in the absorption of exchange pressure (monetary shocks) by the Nigerian monetary authorities and so EMP is insensitive to its constituent variables. It further means that the monetary authorities can determine the amount of intervention needed to realize a targeted exchange rate by using both the international reserves and exchange rate depreciation. Previous studies that have obtained similar results as this include Stavarek, (2007) for Hungary in a study of 8 new European countries, Connolly and da Silveira (1979) for Brazil, and Girton and Roper (1977) for Canada.

**Table 4:** DOLS results of EMP model with S variable

| Variable    | Coefficient | Std. Error | t-Statistic | Prob.   |
|-------------|-------------|------------|-------------|---------|
| C           | 0.58        | 0.27       | 2.09        | 0.05**  |
| D_LDC       | -2.76       | 0.73       | -3.74       | 0.00*** |
| D_LWP       | 0.53        | 0.31       | 1.71        | 0.11    |
| D_LRY       | -1.84       | 0.76       | -2.42       | 0.03**  |
| D_LIR       | -0.60       | 1.29       | -0.46       | 0.65    |
| S           | -0.00       | 0.00       | -0.32       | 0.75    |
| D_D_LDC     | 1.24        | 0.45       | 2.72        | 0.01**  |
| D_D_LDC(1)  | -0.55       | 0.23       | -2.39       | 0.03**  |
| D_D_LDC(-1) | 0.76        | 0.46       | 1.63        | 0.12    |
| D_D_LWP     | -0.16       | 0.59       | -0.27       | 0.79    |
| D_D_LWP(1)  | 0.92        | 0.59       | 1.56        | 0.14    |
| D_D_LWP(-1) | -0.60       | 0.81       | -0.74       | 0.46    |
| D_D_LRY     | 1.16        | 0.51       | 2.25        | 0.04**  |
| D_D_LRY(1)  | -0.13       | 0.18       | -0.72       | 0.48    |
| D_D_LRY(-1) | 0.73        | 0.35       | 2.08        | 0.05**  |
| D_D_LIR     | -0.85       | 1.01       | -0.84       | 0.41    |
| D_D_LIR(1)  | -1.09       | 0.94       | -1.16       | 0.26    |
| D_D_LR(-1)  | -0.53       | 0.71       | -0.74       | 0.47    |

Note: All variables are in natural logarithm (L). \*\* and \*\*\* represent 5% and 1% level of significance respectively

Table 5 displays the results obtained from the diagnostic test of the residuals following the DOLS regression. The results show that the null hypothesis of no autocorrelation and that of absence of ARCH (Heteroscedasticity) cannot be rejected since their p-values are greater than 5% level of significance. The residual also displays that its

behaviour is non linear as the RESET test indicates a p-value (0.26) exceeding 5% level of significance. The functional form therefore confirms the right specification of the model. Lastly, Jarque-Bera test of normality also indicates that the residuals are normally distributed at 5% level of significance.

**Table 5:** Residual test results of EMP model with S variable

|                                    | Obs*R-squared | Prob. Chi-Square | Order |
|------------------------------------|---------------|------------------|-------|
| Breusch-Godfrey Serial Correlation | 3.34          | 0.06             | 1     |
| Heteroscedasticity Test: ARCH      | 1.18          | 0.55             | 2     |
| Ramsey RESET Test                  | 0.65          | 0.26             | 1     |
| Jarque-Bera Normality Test         | 0.73          | 0.69             |       |

In order to analyze the explanatory power of the EMP model with the inclusion of S as independent variable, Figure 2 displays the actual values and the fitted values of the monetary model. A close look at the figure shows that the predicted values appear to have tracked down the actual values considerably well. The movement of the predicted values has the reflection of the actual movement and the two trends follow the same pattern. This implies that the EMP model with the inclusion of independent variable S demonstrates a goodness of fit.

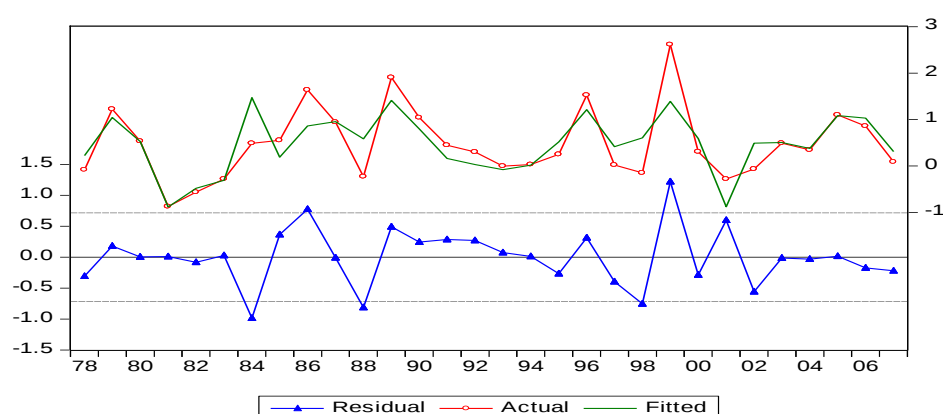


Figure 2: Actual and fitted exchange market pressure with S variable

In order to examine the efficiency of the exchange market pressure (EMP), attempt is made to compare the results obtained from the regression of each component of EMP ( $\Delta FV$  and  $\Delta EX$ ) as individual

dependent variable on EMP's explanatory variables. When the rate of change in foreign reserves ( $\Delta FV$ ) is singly used as dependent variable with EMP's explanatory variables, the reserves (or balance of payments) equation (8) is represented in equation (12).

$$\begin{aligned} \Delta \ln FV_t = & \beta_0 + \beta_1 \ln DC_t + \beta_2 \Delta \ln DC_t + \beta_3 \Delta \ln DC_{t+1} + \beta_4 \Delta \ln DC_{t-1} \\ & + \beta_5 \ln WP_t + \beta_6 \Delta \ln WP_t + \beta_7 \Delta \ln WP_{t+1} + \beta_8 \Delta \ln WP_{t-1} \\ & + \beta_9 \ln RY_t + \beta_{10} \Delta \ln RY_t + \beta_{11} \Delta \ln RY_{t+1} + \beta_{12} \Delta \ln RY_{t-1} \\ & + \beta_{13} \ln IR_t + \beta_{14} \Delta \ln IR_t + \beta_{15} \Delta \ln IR_{t+1} + \beta_{16} \Delta \ln IR_{t-1} + u_t \end{aligned} \quad (12)$$

The DOLS results obtained are presented in Table 6. The results of the parameter estimates appear to be considerably good with R-squared equal to 0.79 and the F-value statistically significant at 5% level.

**Table 6:** DOLS estimates of foreign reserve model

| Variable    | Coefficient | Std. Error | t-Statistic | Prob.   |
|-------------|-------------|------------|-------------|---------|
| C           | 0.26        | 0.20       | 1.28        | 0.22    |
| D_LDC       | -2.69       | 0.55       | -4.88       | 0.00*** |
| D_LWP       | 0.64        | 0.28       | 2.27        | 0.04**  |
| D_LRY       | -1.56       | 0.49       | -3.14       | 0.00*** |
| D_LIR       | -1.88       | 1.07       | -1.75       | 0.10    |
| D_D_LDC     | 1.18        | 0.38       | 3.07        | 0.00*** |
| D_D_LDC(1)  | -0.55       | 0.16       | -3.38       | 0.00*** |
| D_D_LDC(-1) | 0.60        | 0.36       | 1.65        | 0.12    |
| D_D_LWP     | -0.22       | 0.23       | -0.97       | 0.34    |
| D_D_LWP(1)  | 0.79        | 0.34       | 2.27        | 0.04**  |
| D_D_LWP(-1) | -0.38       | 0.52       | -0.73       | 0.47    |
| D_D_LRY     | 0.89        | 0.31       | 2.83        | 0.01**  |
| D_D_LRY(1)  | -0.09       | 0.16       | -0.56       | 0.58    |
| D_D_LRY(-1) | 0.53        | 0.18       | 2.94        | 0.01**  |
| D_D_LIR     | -0.43       | 0.71       | -0.61       | 0.55    |
| D_D_LIR(1)  | -1.35       | 0.58       | -2.34       | 0.03**  |
| D_D_LIR(-1) | -0.54       | 0.48       | -1.12       | 0.27    |

Note: All variables are in natural logarithm (L). \*\* and \*\*\* represent 5% and 1% level of significance respectively

From the results, the estimated coefficients of the domestic credit and real income are negative and significantly different from zero while that of world price is positively significant. However, interest rate does not play any significant role in this model. The results of residual diagnostic test of foreign reserves model presented in Table 7 show that there is no

problem of autocorrelation and heteroscedasticity. Ramsey RESET Test of functional form is also okay and the residual of the model is normally distributed at 5% level of significance.

**Table 7:** Diagnostic test results

|                                    | Obs*R-squared | Prob. Chi-Square | Order |
|------------------------------------|---------------|------------------|-------|
| Breusch-Godfrey Serial Correlation | 3.73          | 0.06             | 1     |
| Heteroscedasticity Test: ARCH      | 0.55          | 0.75             | 2     |
| Ramsey RESET Test                  | 0.77          | 0.84             | 1     |
| Jarque-Bera Normality Test         | 1.09          | 0.57             |       |

The explanatory power of the Nigerian foreign reserves is shown in Figure 3. The figure presents the movements of the actual and the predicted values of the reserve model. By comparison, the predicted values closely trace out the actual values. Considerably, the movement of the actual values is reflected by that of predicted values. Hence, the figure displays a better goodness of fit for foreign reserves model.

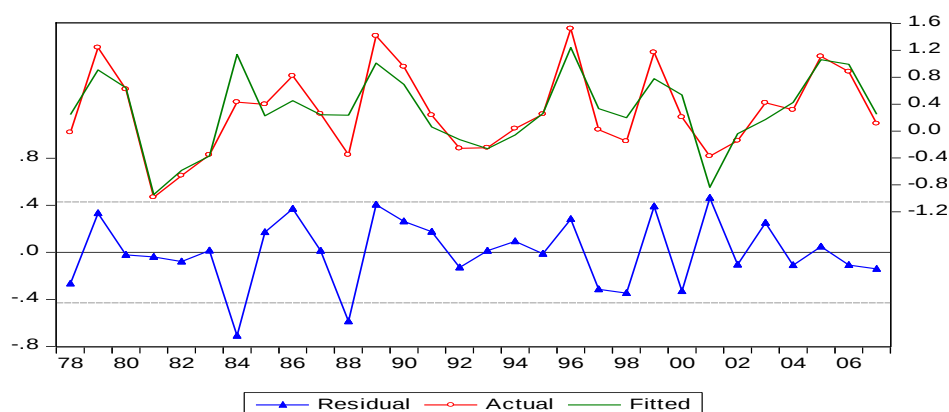


Figure 3: Actual and fitted foreign reserve

When percentage in exchange rate ( $\Delta EX$ ) is singly used as dependent variable with EMP's explanatory variables the exchange rate equation (9) is represented by equation (13).

$$\Delta \ln EX_t = \beta_0 + \beta_1 \ln DC_t + \beta_2 \Delta \ln DC_t + \beta_3 \Delta \ln DC_{t+1} + \beta_4 \Delta \ln DC_{t-1} \\ + \beta_5 \ln WP_t + \beta_6 \Delta \ln WP_t + \beta_7 \Delta \ln WP_{t+1} + \beta_8 \Delta \ln WP_{t-1}$$

$$\begin{aligned}
& + \beta_9 \ln RY_t + \beta_{10} \Delta \ln RY_t + \beta_{11} \Delta \ln RY_{t+1} + \beta_{12} \Delta \ln RY_{t-1} \\
& + \beta_{13} \ln IR_t + \beta_{14} \Delta \ln IR_t + \beta_{15} \Delta \ln IR_{t+1} + \beta_{16} \Delta \ln IR_{t-1} + u_t
\end{aligned} \tag{13}$$

The results of the estimation are presented in Table 8. From the results, domestic credit maintains its right sign while the world price, real income and interest rate are not correctly signed. With the exception of interest rate, these variables are not significant in impacting the exchange rate. In addition, the result of R-squared appears to be very low (0.41) and the F-value is insignificant (0.85). The estimated results of the exchange rate model do not yield better estimates of parameters when compared with the estimated results of the foreign reserves model. Therefore, it is concluded that the main means of absorbing most of exchange market pressure in Nigeria is by adjusting foreign reserves rather than exchange rate adjustment. Such absorption results in depleting the country foreign reserves more than the exchange rate depreciation.

**Table 8:** DOLS estimates of exchange rate model

| Variable    | Coefficient | Std. Error | t-Statistic | Prob.  |
|-------------|-------------|------------|-------------|--------|
| C           | 0.36        | 0.20       | 1.79        | 0.09   |
| D_LDC       | -0.15       | 0.38       | -0.40       | 0.69   |
| D_LWP       | -0.12       | 0.16       | -0.74       | 0.46   |
| D_LRY       | -0.24       | 0.51       | -0.48       | 0.63   |
| D_LIR       | 1.20        | 0.44       | 2.67        | 0.01** |
| D_D_LDC     | 0.12        | 0.19       | 0.62        | 0.54   |
| D_D_LDC(1)  | -0.01       | 0.10       | -0.19       | 0.85   |
| D_D_LDC(-1) | 0.18        | 0.18       | 0.98        | 0.34   |
| D_D_LWP     | 0.08        | 0.37       | 0.22        | 0.82   |
| D_D_LWP(1)  | 0.09        | 0.24       | 0.40        | 0.69   |
| D_D_LWP(-1) | -0.25       | 0.24       | -1.02       | 0.32   |
| D_D_LRY     | 0.25        | 0.29       | 0.86        | 0.40   |
| D_D_LRY(1)  | -0.02       | 0.14       | -0.16       | 0.87   |
| D_D_LRY(-1) | 0.19        | 0.20       | 0.95        | 0.35   |
| D_D_LIR     | -0.40       | 0.48       | -0.83       | 0.42   |
| D_D_LIR(1)  | 0.25        | 0.37       | 0.68        | 0.50   |
| D_D_LR(-1)  | -0.01       | 0.24       | -0.06       | 0.94   |

Note: All variables are in natural logarithm (L). \*\* represents 5% level of significance

The results of residual diagnostic test of exchange rate model presented in Table 9 show that there is no problem of autocorrelation and heteroscedasticity. Also, Ramsey RESET Test of functional form is

okay. However, the residual of the model is not normally distributed at 5% level of significance.

**Table 9:** Diagnostic test results

|                                    | Obs*R-squared | Prob. Chi-Square | Order |
|------------------------------------|---------------|------------------|-------|
| Breusch-Godfrey Serial Correlation | 0.48          | 0.48             | 1     |
| Heteroscedasticity Test: ARCH      | 1.06          | 0.58             | 2     |
| Ramsey RESET Test                  | 3.15          | 0.22             | 1     |
| Jarque-Bera Normality Test         | 16.50         | 0.00             |       |

The explanatory power of the exchange rate model is presented in Figure 4. From the figure, the movements of the actual values and the predicted values when compared perform better in reflecting each other in the first 7 year. After the first 7 year, the two values (actual and predicted values) deviate till the end of the period. This suggests that the model of exchange rate has poor fit.

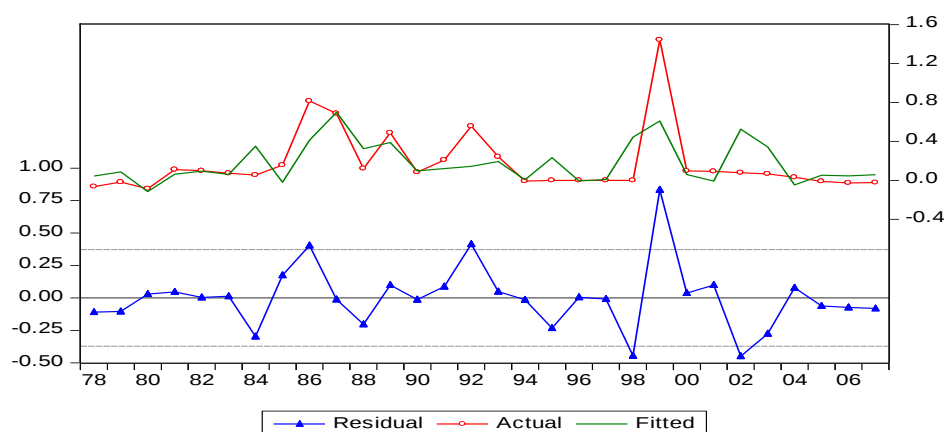


Figure 4: Actual and fitted exchange rate

## 5. Conclusion

In this study, the leads and lags regression method of Stock and Watson (1993), otherwise known as dynamic ordinary least squares (DOLS) regression is employed for the estimation of the monetary model of Exchange Market Pressure (EMP) over the period 1970-2010. The fundamental proposition of the EMP model is that any excess supply of money domestically is offset via the balance of payments and exchange

rate adjustment. DOLS results indicate that the rate of domestic credit and the rate of exchange market pressure are negatively related. Therefore, the estimated results of EMP in the context of Nigeria buttress the EMP propositions. Results of another test, the measure of EMP indicate that there is no discrimination (no choice is made between percentage change in exchange rate and in foreign reserves) in the absorption of exchange pressure (monetary shocks) by the Nigerian monetary authorities and therefore, EMP is insensitive to its constituent variables. The Nigeria's experience shows that the main means of absorbing most of exchange market pressure is by adjusting foreign reserves rather than exchange rate adjustment.

This study is significant in that the measurement of the EMP may furnish useful information to both the public and private sectors regarding exchange rate, international reserves, level of income and interest rate that could influence the nature and degree of transactions. It may also provide information that could be useful to monitor monetary and financial policy domestically and internationally. Such information has the potential of guiding the policy makers in making useful monetary policy.

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**Appendix: Derivation of Monetary Model of EMP**

The monetary model of Exchange Market Pressure is formulated from the money demand function, money supply functions and from purchasing power parity. The money demand function is given in equation 1 as:

$$M^D = k.DP.RY.IR \quad (1)$$

Where  $M^D$  is the money demand, DP is the domestic price level (consumer price index), RY is the real income (real gross domestic product), IR is the nominal interest rate, and k is a constant, expressing the proportion of real income preferred to be held as cash balance by individual. Under the presumption of a small country, the purchasing power parity (PPP) holds and expresses the ratio of domestic price level (DP) to the world price level (WP) via the nominal exchange rate (EX). Thus, it is given as:

$$EX = DP/WP \quad (2)$$

From equation 2, make DP the subject of formula and substitute for DP in the money demand equation 1 to get

$$M^D = k.EX.WP.RY.IR \quad (3)$$

The money supply function is given in equation 4 where  $M^S$  is the domestic money supply, FV is the international asset, and DC is the domestic credit or domestic asset. The money multiplier is constant and taken to be unity. The equation 4 is a process of money supply which comprises variation in international reserves through the balance of payment and a variation in domestic credit through the banking system.

$$M^S = FV + DC \quad (4)$$

At equilibrium, change in domestic money demand  $\Delta M^D$  must equal change in domestic money supply  $\Delta M^S$  and it is given as follows:

$$M^D = M^S \quad (5)$$

Substitute  $M^D$  from equation 3 and  $M^S$  from equation 4 into equation 5 to get the resulting equation 6

$$FV + DC = k.EX.WP.RY.IR \quad (6)$$

The two sides of equation 6 are expressed in logarithm form to give equation 7 (Ghartey, 2005; Parlaktuna, 2005) and by differentiating equation 7 with respect to time t, we have equation 8:

$$\log(FV + DC) = \log k + \log EX + \log WP + \log RY + \log IR \quad (7)$$

$$\frac{\partial}{\partial t}(FV + DC) = \frac{\partial}{\partial t}(k) + \frac{\partial}{\partial t}(EX) + \frac{\partial}{\partial t}(-WP) + \frac{\partial}{\partial t}(-R) + \frac{\partial}{\partial t}(IR) \quad (8)$$

The expression in equation 8 can be written as in equation 9 with k taken to be constant

$$\frac{(\Delta FV/\Delta t)/(FV + DC) + (\Delta DC/\Delta t)/(FV + DC)}{(\Delta EX/\Delta t)/(EX) + (\Delta WP/\Delta t)/(WP) + (\Delta R/\Delta t)/(R) + (\Delta IR/\Delta t)/(IR)} = 0 \quad (9)$$

The expression in equation 9 as percentage changes can be expressed in the form of equation 10.

$$\frac{\Delta FV/(FV + DC) + (\Delta DC)/(FV + DC)}{(\Delta EX)/(EX) + (\Delta WP)/(WP) + (\Delta R)/(R) + (\Delta IR)/(IR)} = 0 \quad (10)$$

The specification in equation 10 can be simplified to give the expression in equation 11.

$$\frac{(FV - FV_{t-1})/(FV + DC) + (DC - DC_{t-1})/(FV + DC)}{(EX - EX_{t-1})/(EX) + (WP - WP_{t-1})/(WP) + (R - R_{t-1})/(R) + (IR - IR_{t-1})/(IR)} = 0 \quad (11)$$

Further simplification of the equation 11 for the elimination of the denominators gives the expression in equation 12.

$$\begin{aligned} & [(FV - FV_{t-1})/(FV + DC) - (FV_{t-1})/(FV + DC)] + [(DC - DC_{t-1})/(FV + DC) - (DC_{t-1})/(FV + DC)] = \\ & [(EX - EX_{t-1})/(EX) - (EX_{t-1})/(EX)] + [(WP - WP_{t-1})/(WP) - (WP_{t-1})/(WP)] + [(R - R_{t-1})/(R) - (R_{t-1})/(R)] \\ & + [(IR - IR_{t-1})/(IR) - (IR_{t-1})/(IR)] \end{aligned} \quad (12)$$

By solving equation 12, taking logarithm into consideration, it gives equation 13 and 14 respectively.

$$\begin{aligned} & [FV - FV_{t-1} - DC - (FV_{t-1} - FV - DC)] + [DC - FV - DC - (DC_{t-1} - FV - DC)] = \\ & [EX - EX_{t-1} - (EX_{t-1} - EX)] + [WP - WP_{t-1} - (WP_{t-1} - WP)] + [R - R_{t-1} - (R_{t-1} - R)] \\ & + [IR - IR_{t-1} - (IR_{t-1} - IR)] \end{aligned} \quad (13)$$

$$\begin{aligned} & [FV - FV_{t-1} - DC - FV_{t-1} + FV + DC] + [DC - FV - DC - DC_{t-1} + FV + DC] = \\ & [EX - EX_{t-1} - EX_{t-1} + EX] + [WP - WP_{t-1} - WP_{t-1} + WP] + [R - R_{t-1} - R_{t-1} + R] \\ & + [IR - IR_{t-1} - IR_{t-1} + IR] \end{aligned} \quad (14)$$

Addition and subtraction of like terms in equation 14 result in the expression in equation 15

$$[FV - FV_{t-1}] + [DC - DC_{t-1}] = [EX - EX_{t-1}] + [WP - WP_{t-1}] + [R - R_{t-1}] + [IR - IR_{t-1}] \quad (15)$$

In their logarithm form, equation 15 can as well be expressed in their percentage changes as given in equation 16

$$\Delta \ln FV + \Delta \ln DC = \Delta \ln EX + \Delta \ln WP + \Delta \ln RY + \Delta \ln IR \quad (16)$$

In its general form, equation 16 can be re-specified to give equation 17 by adding the parameters and in which all the parameters are non-negative.

$$\Delta \ln FV - \Delta \ln EX = -\beta_1 \Delta \ln DC + \beta_2 \Delta \ln WP + \beta_3 \Delta \ln RY + \beta_4 \Delta \ln IR \quad (17)$$

Equation 17 is a fundamental equation of the monetary model of Exchange Market Pressure (EMP =  $\Delta \ln FV + \Delta \ln EX$ ).

## **Poverty Alleviation and Identifying the Barriers to the Rural Poor Participation in MFIs: A Case Study in Bangladesh<sup>1</sup>**

Mohammad A. Ashraf<sup>2</sup> and Yusnidah B. Ibrahim<sup>3</sup>

The main purpose of the study is to identify the barriers of participation of the rural poor in microfinance institutions (MFIs) in Bangladesh. To this aim, data were collected through face to face interview from six different districts of Bangladesh. From the microfinance literature, the study set eight explanatory factors and six demographics which are explored through three separate models in examining the factors that influence the dependent variables such as nonparticipation and drop-out (Model 1), participation (Model 2) and nonparticipant but willing to participate (Model 3) in MFIs. Logistic regression techniques are employed in analyzing data. The results of Model 1 indicate that education, other assets and spousal dislike to female head of households are observed as the significant barriers of participation. The outcome of the Model 2 suggests that there have been six factors that inhibit the rural poor participation in MFIs which are gender, age, yearly income, land, religion and lack of knowledge. And in the Model 3, gender, education, land, insufficient resources and lack of knowledge appear to be the significant barriers to participation of the rural poor in MFIs in Bangladesh.

### **Introduction**

Developing world has experienced several paradigm shifts in development strategies (Ahmed 2004) since December 10, 1948 when poverty was attributed as a negation of all human rights by the declaration of the General Assembly of the United Nations. Article 25(1) of the declaration has proclaimed:

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“Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing and medical care, and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.”

However, the result of each initiative failed to produce any significant result (Yunus, 1987). Against this backdrop, microcredit propelled its head start in Bangladesh in the early 1980s in the name of Grameen Bank with a promise to bring about development through alleviating rural poverty. The age of microfinance, popularly known as microcredit (Ahmed, 2009; Rutherford, 2003; Hulme, 2000) is now turned around thirty, but the level of poverty alleviation remains as an empirical question (Karim, 2011).

Surge of literature came out during 1980s and 1990s with the result of positive impacts of microcredit on income and poverty alleviation (Hossain, 1984; Khan, 1990; Khandker, Khalily and Khan, 1995; Khandker and Chowdhury, 1996)). However, empirical evidences cast doubts on many of their positive impacts on poverty alleviation and raising income of the participants in MFIs. Recently, there have been a plethora of research articles which have criticized microfinance institutes (MFIs) from different dimensions particularly on poverty alleviation. Some of them have been even more critical to show that a few microfinance programs are rather harmful, plunging the poor deeper into debt (Dichter and Harper, 2007; Beck and Ogden, 2007).

The criticisms, which center in prominence, lie around participation and nonparticipation of the rural poor in MFIs (Karim, 2011). The issues of nonparticipation include outreach, dropout, self-exclusion and overlapping of loans from multiple MFIs that are presumed to be important for persisting rural poverty (Caritas Bangladesh, 2012; Halder and Mosley, 2004). For instance, Caritas Microfinance Program (CMFP) has recently closed 11 of its branches in different places of Bangladesh. The outstanding loan stood at Tk. 1,500 million as on June 30, 2012 against the amount of Tk. 1,303 million in June 30, 2011. This means that growth of outstanding loan increases by 14 percent. During the same period of time, the annual decrease of members was 13,804 (Caritas Bangladesh, 2012)

Interestingly, the potential reasons of nonparticipation are not widely addressed in microfinance related literature, though microfinance, since its initiation, has undergone many changes as an economic development scheme to assist low-income people in rural areas (Ashraf, 2013; Yuge, 2011). Low level of participation among the poor is, thus, still one of the main issues in microfinance sector which deserve attention by policy makers and researchers (Hes, Neradova and Srnec, 2013; Mahmud, 2000; Halder and Mosley, 2004). The main objective of the present study is, therefore, to investigate the potential factors that are assumed to influence the participation and nonparticipation of the rural poor in Bangladesh.

### **Participation and Nonparticipation: Conceptual Issues**

There have been different participation behaviors staged in the microfinance activities by the rural poor which warrant little clarification. While participation in MFIs is characterized by an individual level, household-level participation is perceived to be a derived one (Ashraf, 2013; Zohir, 2001). If one or more members of a household participate in one or more MFIs, the particular household is also identified as “participant” (Zohir, 2001).

By and large, all individuals who report to be members of MFIs are identified as participants. However, one may distinguish between “active” and “passive” participation. Active participants are those who borrow funds, regularly attend the meetings and deposit required savings in MFIs. Hence, participation is operationally defined to include those who are active group members (Zohir, 2001).

The above static classification is further complicated due to its instability in participation itself. The BIDS surveys over three phases show that a large number of individuals change their affiliation or temporarily disassociate themselves from the MFIs every year. Thus, one needs further classification across “never participated”, “ever participants”, “regular participants”, occasional participants” and “dropouts” (Ashraf, 2011a; Zohir, 2001). However, the present study adopted three simple classifications --- (i) “participants”: who are presently involved in borrowing from MFIs; (ii) “nonparticipants”: who are not presently involved in borrowing from MFIs which include the individuals who never participated in MFIs or dropouts from the MFIs and (iii) who are willing to participate.

### **Theory and Past Research**

Microfinance theory has been widely acclaimed nationally and internationally as a potential tool for eradicating rural poverty since its inception as Grameen Bank in Bangladesh in 1983. The bank is a brainchild of Professor Muhammad Yunus who won the Nobel Peace Prize in 2006. Though this Nobel is a grand recognition for the great achievement of the Grameen Bank in poverty alleviation particularly from the rural areas of the developing world, huge criticisms from multiple dimensions have been casting pebbles against microfinance industry as a whole through empirical research globally. Some even posit that microfinance has done more to hurt the rural poor than to help them (Karim, 2011; Beck and Ogden, 2007; Dichter and Harper, 2007).

Soon after 1983, the innovative model of the Grameen Bank has been replicated by many countries of the world including many developed nations. Until now, there is no empirical evidence which can testify that any society globally becomes successful in alleviating poverty from the society with the particular help of MFIs (Karim, 2011). One may argue that human index as well as overall poverty condition in Bangladesh is much improved than before (Sen 2013). However, it does not mean that the achievement of poverty alleviation in Bangladesh is due to microfinance intervention (Ashraf, 2013; Dilal, 2009). Rather, there are other factors that influenced to reduce poverty in Bangladesh such as increase in agricultural productivity through green revolution, foreign remittance, increased investment and labor productivity, and mass employment opportunities in garments sector, financial sector, education and corporate business sectors (Ahmed, 2013).

Owing to such ineffective role of microfinance industry in eradicating poverty, participation and membership growth in MFIs have appeared grotesque. In a longitudinal study, the nonparticipants in MFIs are observed to be 28 percent (Zohir, 2001). However, the study notes that the census of households indicates that about 52 percent of rural households in program villages were nonparticipants (Zohir, 2001). Since stability in participation was presumed in earlier literature, most recent focus is placed on explaining the determinants of participation where presence of program placement effects and self-selection often obscure the results.

Here in the following section, we discuss the factors underlying microfinance participation based on past research. The study identifies eight variables that are hypothesized to hinder the participation of the rural poor in MFIs which are: (i) fear of getting into risk in taking microfinance loans, (ii) individual preference of selecting the MFIs for borrowing, (iii) religious leaders' lecture on microfinance borrowing, (iv) spousal dislike as female head of household, (v) friends' advice on microfinance borrowing, (vi) insufficiency of resources, (vii) inadequate knowledge about business and (viii) illness or vulnerability to crises.

**(i) Fear of getting into risk in taking microfinance loans:**

Among the several socioeconomic service-providers available in Bangladesh, NGO-MFIs occupy the most remarkable place and the participation of the poor people in these NGO-MFIs is relatively higher (Ashraf, 2013; Rahman, 2009). However, perceptions of the poor in terms of expectation fulfillment and trust deficit in NGO-MFIs stands among the lowest percentage points which lead the rural poor to be in misty confusion and high economic insecurity (Rahman, 2009). And the major consequences of insecurity are financial loss and mental anxiety (Karim, 2011; Rahman, 2009). In addition, harassment by many NGO-MFIs is a critical social element experienced by citizens of contemporary Bangladesh (Dyal-Chand, 2007; Ferdous and Uddin, 2010).

A recent study revealed the analytical content of this harassment indicator and reports a significant range of misconduct from the NGO-MFIs experienced by the poor who are to pay high economic costs (Ferdous and Uddin, 2010). For instance of harassment, the residents of Arampur in northern Bangladesh report horror stories such as physical and sexual abuse of borrowers in the hands of MFIs' officials. Unauthorized repossession of assets, including even the roof of the house of a loan recipient, frequently happens when borrowers miss their installments (Ferdous and Uddin, 2010).

In the case of arrears and defaults, there have been several daunting disturbing stories available in microfinance literature since 1990s (Karim, 2011; Rahman, 1999). By and large, conventional MFIs used to utilize group and center pressure to force the borrowers to make weekly repayments of their loans. When the peer pressure fails to pay the

weekly installment of the loans, sometimes threats from the MFIs are followed and in extreme cases, assets of the poor borrowers are auctioned by the MFIs for repaying the loans (Ferdous and Uddin, 2010). In such way, many rural poor lost all of their scanty belongings including houses and small home-lands (Karim, 2011).

As the MFIs began to mature, they started facing performance dilemma, and focus is gradually shifted towards profitability. In order to improve profitability of MFIs, interest rate on loan is kept at a very high level and additional costs in the form of margin money, compulsory savings and insurance premium are being imposed to borrowers (Elahi and Rahman, 2006).

Majority of microfinance borrowers in rural Bangladesh are poor and illiterate. So, they are not in a position to understand and realize various financial terms and conditions used by MFIs and their effective costs. To help the poor to understand true costs of loan, MFIs should disclose effective interest rate to the borrowers. Hiding effective interest rate to poor and illiterate borrowers by using “creative” accounting practices is highly unethical. Many MFIs simply state that they charge only 15% flat rate of interest (Pine, 2010). Nonetheless, the effective interest rate including processing fee, insurance premiums and compulsory savings goes well over 100% per annum (Karim, 2011; Dilal, 2009).

In order to pay back the loans timely, bank workers as well as group-members impose an extreme demand on their clients (Ferdous and Uddin, 2010). In this situation, many borrowers used to maintain their regular repayment schedules through a process of loan recycling which considerably increases the debt-liability on the individual households, increases tension and frustration among household members, produces new forms of dominance over women and increases violence in society (Dyal-Chand, 2007; Rahman, 1999). This type of apprehension is widespread in the rural society of Bangladesh where people appeared to be reluctant to be member of any MFIs (Karim, 2011). Thus, fear appears to be potential barrier to the rural poor participation in MFIs in Bangladesh.

**(ii) Individual preference of selecting the MFIs for borrowing**

Individual preference is hypothesized in this study as another barrier to participation in MFIs. Ideally, preference is the power or ability to choose one thing over another with the anticipation that the choice will result in greater satisfaction, greater capability or improved performance (Schiffman and Kanuk, 2000). Thus, in first preference, people try to have loans from informal sources. One of the important sources of informal loans is the friend or relative who occupies a substantial part of rural money market (Mahmud, 2010).

So, if anybody has that chance of getting informal loans, s/he does not wish to take the loans from MFIs. In fact, when the poor villagers have left with no other choices, microfinance is considered to be their last resort. "I don't want to take microcredit loans," said one villager, "but at times of food shortage in the dry season, I am left with no other choice" (Ferdous and Uddin, 2010, p. 43). Thus, many people in the village in northern Bangladesh became constrained to take loans during a household crisis such as lack of foods in the house or medical emergencies. For many, the borrowing initiated a cycle of debt which they could never escape. As mentioned earlier that the northern part of Bangladesh is declared as a famine-affected area, from where people prefer to migrate in the off-season of crop production rather than taking loans from the MFIs for doing any small-business staying in their own locality (Mahmud, 2010).

There has been another significant question whether MFIs are serving the poorest of the poor ensuring their successful participation in microfinance programs (Hashemi and Rosenberg, 2006). Soliciting case studies of CARE/Bangladesh and BRAC/Bangladesh, one report argues that in Bangladesh where MFIs are strongly committed to serve the poor, MFIs' concentration is the highest among the second poorest quintile group and the lowest among the poorest quintile. The main reason behind this is identified as deliberate program exclusion from MFIs (Hashemi and Rosenberg, 2006).

According to a study, young women have a higher preference for credit than older women (Khandker, Koolwal and Sinha, 2008). The study compares the results for young women's program participation with those of program participation by two other groups --- older women (31

and older) and men residing in the households. The young women's borrowing is statistically significantly different from that of men's borrowing but not different from that of older women. However, the marginal returns to program participation are significantly higher for younger women than older women (Khandker, Koolwal and Sinha, 2008).

Finally, the debate about whether to lend to individuals or lend to groups is very important issue. Under simple theories of selection, the Pareto superior regime predicts to emerge variation with exogenous environmental characteristics (Townsend, 2003). The microfinance programs, which are originated in Bangladesh, primarily operate in group lending where individual preference does not play any role in using loans in individual entrepreneurial activities (Ashraf, 2013). Thus, it may pose a serious problem in getting individual success in loan operation on an individual basis rather than on a group basis (Townsend, 2003).

In this respect, some argue that nonparticipation might simply be a function of individual or household preferences, because credit may not be in their best short or long-term interest (Evans et al., 1999). These preferences could change the participants' and nonparticipants' attitude towards behavioral intention (Ajzen, 1991), which encourages for not being the member of the MFIs.

### **(iii) Religious leaders' lecture on microfinance borrowing**

The rural society of Bangladesh is built in local networks in which religion takes a prominent place, because around 87 percent people are Muslim (BBS, 2011) and Islam is the state religion in Bangladesh. Around 90 percent of the laws in Bangladesh are secular. So, there are legal problems in Bangladesh arising from unresolved conflicts in the law. Hence, women independence or women empowerment program is against the beliefs of many strict Muslims (Ahmad, 2009).

Some studies find that women violating *purdah* (females' physical exposure without any headscarf and extra clothes) by joining an interest-based microcredit program have violated the Islamic principles. So these activities are strongly condemned by religious leaders who attack on

microcredit institutions defending the religious values of Islam (Ashraf, 2013; Hashemi and Schuler, 1992; the *Economist*, 2000).

The issue of gender inequality is also important in the environment where social activities are based on existing socioeconomic inequality of women (Dyal-Chand, 2007; Heaton and Cornwall, 1989). Empirical evidence suggests that much of the variation in the relative socioeconomic status of women is due to differences in family behavior, and there is little evidence for the declining influence of religion in family behavior or in the socioeconomic inequality of women (Dyal-Chand, 2007). So, it evidently shows how religious point of view in looking at the status of women is a factor for participating in MFIs.

#### **(iv) Spousal dislike as female head of household**

In most of the developing countries, society is dominated mostly by the male partner of the family. Yet, the majority of the borrowers of conventional MFIs are women (Ashraf 2013; Caritas Bangladesh, 2012; Rahman, 1996). The objective of targeting women in the conventional approach is women empowerment (Caritas Bangladesh, 2012; Karim, 2011; Rahman, 1999). The rationale is that women use the funds efficiently to increase their income levels. As a result, they become more independent and this increases their self-respect. However, some recent studies show that this is not the case (Ashraf, 2013; Karim, 2011; Khandker, 1998; Rahman, 1999). The women are usually persuaded by the male members of the household to obtain credit and to utilize it. However, the repayment of the loan installment remains on the shoulder of the women who is deemed primarily as the borrower. This generates chaos and conflicts inside the family (Ashraf, 2011b).

There has been evidence that microcredit can reduce vulnerability in terms of smoothing income and consumption, and building asset (Zaman, 2004). However, there is a considerable confusion on the impact of credit on women's empowerment, or reducing female vulnerability (Karim, 2011). Empowerment of women in Bangladesh can be considered on the patriarchal socioeconomic background. Empowerment has been defined as a "set of social relations with a material base that enables men to dominate women" (Cain, Khanum and Nahar, 1979, p. 405). Hence, it can be thought of as an improvement in intra-household gender relations (Hashemi, Schuler and Riley, 1996).

Moreover, given the institution of *purdah*, an enveloping social matrix controls the female society within a typical Bangladeshi household (Ashraf, 2011b; Mahmud, 1994).

There are more interesting stories which reveal that while women are meant to be the primary targets of MFIs, they are more often the conduits of credits, not end-users (Ferdous and Uddin, 2010). In this context, one villager explained, “Women take loans because their husbands ask them to do so. In most cases, failure to repay is not their fault, but because their husbands either squandered the money or lost it in a wrong investment. Instead of being empowered, these women are like chilies crushed between the mortar and the pestle. On one side, their husbands put pressure on them. On the other side, MFIs chase them for being loan defaulters.” (Ferdous and Uddin 2010, p. 43)

Some authors observe that the female-headed households are experiencing much socioeconomic disadvantages which range from economic discrimination to social stigmatization and isolation. This situation limits the capability of these women to meet up the endowment requirements for participating in microcredit schemes. Normally, the spouses of the female members of the MFIs do not like their wife to be the chief of the household (Ashraf, 2013; Buvinic and Gupta, 1997). This fact frequently acts as an important catalyst for family disintegration in rural Bangladesh (Rahman, 1999). In many instances, obeying *purdah* by the Muslim ladies is argued to be mandatory by the male spouses based on religious principles of Islam which may act as an important barrier to participation in MFIs (Ashraf, 2011b).

However, there are other studies that show that many families are getting disintegrated which is blamed as a result of women empowerment in the rural areas of Bangladesh (Ashraf, 2013). In fact, freedom is a risky business, because the rural women are mostly uneducated and this dimension of the rural society causes the women to be demotivated to peacefully lead their family life (Bush, 2013).

#### **(v) Friends advice on microfinance borrowing**

In rural areas, people are relatively more closely associated with each other than urban areas (Feldman, 1999). Thus, neighbors sometimes play a crucial role in influencing decision making process of others

(Ajzen, 1999). As there are scanty evidences that participants are graduating from poor to non-poor, the rural poor used to be demotivated to participate in the microfinance programs (Ahmed, 2004). Besides, there are evidences of overlapping loans from various MFIs simultaneously and consequently the borrowers get caught in the vicious circle of debt trap (Ashraf, 2011c; Rahman, 1996). For this reason, the poor sometimes become compelled to dispose whatever they possess as asset in order for repaying back the debt. Thus, the poor become poorer getting into the debt-spiral (Beck and Ogden, 2007). These events created an ugly impression of microfinance programs to the rural poor for which they used to advice their peers and relatives not to participate in MFIs.

On April 14, 2010, a television program in Bangladesh aired a mind-boggling incidence. A few youths in a village of Naogaon district in northern Bangladesh were taking their own lives after failing to repay their loans. The cause of such tragedies was being claimed to be exorbitant interest rates, which trap the borrowers into a never-ending loop (Ferdous and Uddin, 2010).

Similar experience is shared by a villager of Rangpur district of northern Bangladesh with the author of the present study. According to his experience, the poor villagers have been suffering from the extortions of three types of people in Bangladesh such as the corrupt police forces, the greedy and dishonest medical doctors and finally the MFIs (Ashraf, 2011b). Having witnessed these scenarios of microfinance, friends in the neighborhood express negative impression about MFIs which discourages the poor not to participate in microfinance programs.

#### **(vi) Insufficiency of resources**

In the rural areas of Bangladesh, insufficiency of resources of the rural poor is frequently observed as an important impediment of participation in MFIs (Ashraf, 2011b; Montgomery, 1996). A case study on BRAC reports that there ought to have compatibility between credit disbursement and need of the poor borrowers in the rural areas of Bangladesh (Montgomery, 1996, Rahman, 1999). Due to this mismatch between demand and supply of microfinance, the poor are failing to make their own resource-base. It also argues that the poor can be rescued from socially damaging peer pressure lending practices through

flexible repayment scheduling, savings facilities and short-term consumption loans with a bit higher interest rate.

In order to get loan from MFIs, the participants need to have sufficient resource-base to fulfill certain requirements such as adequate time to attend meetings, cash reserves for savings, and energy and motivation for education and planning activities (Ashraf, 2013; Evans et al., 1999). Owing to this lacking of sufficient resources, the rural ultra-poor used to face tremendous difficulties for memberships in MFIs. Even, the microfinance program itself has no incentive to provide loans to the extreme poor, mainly because the ultra-poor are thought to be risky clients who would not be able to pay back their loan duly (Ashraf, 2011c).

Hence, the poorest of Bangladesh have number of constraints such as fewer income sources, worse health and education (Zaman, 2004). So this kind of lacking in terms of sufficient resources prevent the rural poor to utilize the loans with a significant level of efficacy which may affect the participation of the rural poor in MFIs (Ashraf, 2011c).

Proper allocation of time (how much time to spend on different tasks) is also considered to important which may inhibit some individuals to participate in MFIs (Dewhurst, Hancock and Ellsworth, 2013). This object is particularly applicable for the rural female for whom time has an opportunity cost which may not be affordable by them (Noble, 2010; Evans et al., 1999).

#### **(vii) Inadequate knowledge about business**

Across a broad range of literatures, a consensus has emerged that our society is moving toward postindustrial or post-bureaucratic society in which knowledge and information drive economic growth (Dewhurst, Hancock and Ellsworth, 2013; Benkler, 2006; Castells, 2000; Huber, 2004; Powell and Snellman, 2004; Sunstein, 2006; Teece, 2003). According to some studies, there has been a disability of knowledge of the potential clients which compromise to understand the benefits of credit (Ashraf, 2011b; Jazairy et al., 1992). Evidences also suggest that people have a desire to join the program, to function within a peer group and to successfully utilize credit, but due to extreme poverty they cannot afford to do it (Ashraf, 2013).

One of recent studies reports that the field officers of MFIs used to promote microcredit to the poor, as the sales executives of commercial banks promote personal loans and credit cards (Ferdous and Uddin, 2010). Their main objective is to sell loans, not to bring about any change in the lives of the rural poor. It saddles the loan recipients with the insidious burden of dependency contrary to economic freedom. In addition to this reality, a villager's saying is worthwhile to note:

“In the beginning, the NGOs told us their loans would bring joy to our lives if we borrowed from them and started a business. They lured us into the loans by telling that we would have chickens, latrines, and many other things to lead a good life. That good life became obvious as we sank deeper into the quicksand of illusion created by them. This illusion eventually tightens around our neck like a noose.”  
(Ferdous and Uddin, 2010, p. 43)

#### **(viii) Illness or vulnerability to crises**

The size of the vulnerable population, who are at the risk of falling into deeper poverty, is large in Bangladesh. A high concentration of consumption expenditure around poverty lines implies that shocks can cause large movements in poverty rates (Ahmed, Narayan and Zaman, 2009). The relative positions of the upper and lower poverty lines and the density curve also suggest that a large number of population falls between the upper and lower poverty line levels. This fact implies that even a small shock can send a large number of individuals, many of whom are already poor, into extreme deprivation (Ahmed, Narayan and Zaman, 2009).

Natural disasters, due to seasonal cycles, play a key part in poverty process in Bangladesh (Rahman, 1995). In this respect, asset creation is an important determinant which can reduce household vulnerability to various livelihood crises (Zaman, 2004). And one pathway by which microfinance appears to reduce this vulnerability is through the emergency assistance provided by many microfinance organizations during acute natural disasters, such as the recent floods in Bangladesh

(Mahmud, 2010). The fact that these organizations turn into *de facto* relief agencies which is crucial to sustaining these households in the immediate aftermath of a natural disaster. Moreover, post-disaster rehabilitation assistance, in terms of both financial and other services, is also highly valued by microcredit participants (Mahmud, 2010).

One study reveals that while microcredit is successful at reaching the poor, it is less successful at reaching the vulnerable poor (Amin, Rai and Topa, 2003). The results of this study also suggest that microcredit is unsuccessful at reaching the group most prone to destitution or the vulnerable poor. This finding indicates that participation of the destitute in microfinance program is still in unsatisfactory level which warrants further attention in order to alleviate rural hard core poverty in Bangladesh (Amin, Rai and Topa, 2003).

There is different opinion that microcredit often improves the capacity of households' risk management capacity through the enhancement of social capital. This is partly achieved by deliberate training and capacity-building efforts and partly through fungibility of loan proceeds into the building up of social networks (Mosley and Rock, 2004). This, in turn, may lead to 'poverty externalities' through the extension of credit groups to include poor people and through the stabilization of rural income, to reduce the vulnerability of the poorest to risk (Mosley and Rock, 2004).

However, other studies show that microfinance program participants do not benefit in terms of greater level of consumption, but they participate because they benefit from risk reduction by diverting the funds from investing in microenterprises to consumption (Yuge, 2011; Morduch, 1998). Like others, ill-health of the rural poor or any types of crisis may hamper the ability to operate the microenterprises successfully. This may refer to a barrier to participation (Ashraf, 2013).

Participation is further constrained among potential clients suffering from ill-health or other crises that limit their capacity to acquire and utilize credit (Yuge, 2011). This is in other words called morbidities or susceptibility to outer shock or crisis. This problem can hamper the borrowers' self-efficacy to handle the loans for their income generating activities (Rahman et al., 1992)

Thus, there is a need for a holistic approach to risk management, or "social risk management", which encompasses a broad spectrum of private and public actions (Ashraf, 2011b). An asset-based approach to social risk management can provide an integrated approach to consider household, community, and extra-community assets and risk management strategies. In effect of this vulnerability crisis, the rural poor face problem to get membership in MFIs (Ashraf, 2013; Amin, Rai and Topa, 2000).

### **Data Sources**

The data collection exercises were aimed at gathering information on the impact of eight factors along with the demographics that may affect participation and nonparticipation of the rural poor in MFIs in Bangladesh. To this aim, data were collected by face to face interview from six major areas of Bangladesh using closed-end questionnaire interviewing 424 respondents who are participating (144 respondents) and nonparticipating (280 respondents) in MFIs in Bangladesh. The questionnaires were constructed in a 5-point scale except the participation variable which is dichotomous as 1 indicates yes and 2 indicates no. In the measurement for other variables, scale 1 indicates strongly disagree and scale 5 indicates strongly agree.

The respondents of this study are the rural villagers who are nonparticipating, participating and willing to participate in MFIs in six different regions of Bangladesh. These areas of data collection were selected based on the poverty concentration and considerably long duration of microfinance operation. The poverty index was collected from the public and academic sources of information recorded in the Bangladesh Bureau of Statistics and several research journals.

Participating rural poor (also referred to as members of the MFIs) are defined as those individuals who have been presently borrowing microloans from the MFIs. Nonparticipating rural poor (also referred to as non-members or drop-outs from the MFIs) are those individuals who choose not to be involved in borrowing microcredit from their local existing MFIs. The respondents, who are willing to participate, refer to never-participants as well as drop-outs from the MFIs. The sample statistic of the present study is provided in Table I indicating valid percentage of the demographic parameters.

**Table I**      Sample Statistics

|                                               | Valid Percent |
|-----------------------------------------------|---------------|
| <b>Gender</b>                                 |               |
| Male                                          | 13.8          |
| Female                                        | 86.2          |
| <b>Age</b>                                    |               |
| 15-25                                         | 11.2          |
| 26-40                                         | 56.4          |
| 41-55                                         | 23.1          |
| 56-60 and above                               | 9.3           |
| <b>Marital Status</b>                         |               |
| Single                                        | 9.3           |
| Married                                       | 89.3          |
| Divorced                                      | 1.7           |
| <b>Education</b>                              |               |
| Primary                                       | 64            |
| Secondary                                     | 26.7          |
| Higher Secondary                              | 5.5           |
| Bachelor                                      | 3.8           |
| <b>Yearly Household Income (in Taka)</b>      |               |
| 0-20000                                       | 11            |
| 20001-40000                                   | 11.6          |
| 40001-70000                                   | 23.6          |
| 70001-100000                                  | 27.6          |
| More than 100000                              | 26.2          |
| <b>Total Land including Home (in Decimal)</b> |               |
| 0                                             | 25            |
| 1-33                                          | 36.9          |
| 34-66                                         | 20            |
| 67-100                                        | 9.3           |
| More than 100                                 | 8.8           |
| <b>Other Assets (in Taka)</b>                 |               |
| 0-20000                                       | 60.2          |
| 20001-40000                                   | 4.5           |
| 40001-70000                                   | 7.6           |
| 70001-100000                                  | 6.7           |
| More than 100000                              | 21            |

## **Methodology**

Identification of the factors that explain the behavior of the rural poor participation in MFIs is considered as an important issue which needs to be addressed adequately. By and large, a host of client-related and program-related factors determine the involvement of individuals in MFIs. The present study deals with the client-related factors that inhibit them to participate in MFIs.

The study uses the primary data to anticipate on the potential barriers of the rural poor to program participation. For each of the barriers, discussed in separate sections, the study briefly advances some preliminary thoughts on participation, describes the model with short elaboration on some important determinants and finally presents the results with their interpretations.

The study initiates participation in MFIs as a rational response on the part of the individuals to the stimulation caused by a range of pecuniary and non-pecuniary provisions of the MFIs. Whether their response constitutes a cognizable pattern, with regards to the socioeconomic characteristics of the households and to those of the borrowers in the households, is what we are to point out at this level.

In so doing, the study first constructs the models explaining the participation attributes of individuals and examines it using the data of 424 households in six program villages in Bangladesh. The study then identifies the barriers that explain the participation behavior of the individuals. Including dichotomous nature of the outcome variable in the model, the study uses the logistic regression for estimation of the models.

## **The Models**

As barriers or determinants of participation can be examined from various different perspectives, the simplest form of distinguishing is merely between participation and nonparticipation. However, the present study considers participation from a variety of concerns. Most analyses include participation just having dichotomized between participants and nonparticipants which may lead to a selectivity bias. The questionnaire that is designed for this study to collect data provides the prospects of

collecting additional information on willingness to participate or not to participate in MFIs.

This added information yields to identify three mutually exclusive household-members such as (1) those of group who are currently nonparticipating, but might participate before (2) those of group who are currently participating and (3) those of group who are nonparticipating and willing to participate. These groupings aided the study to conduct the analyses on a more meaningful way for four independent subsets of data.

The first set representing Model 1 utilizes the data set of group (1) for those who are presently nonparticipants and participated before (i.e. dropouts). Model 2 represents the data set of the group (2) who are currently participating in MFIs. And finally, Model 3 is analyzed with the data set of group (3) who are willing to participate in future. While an identical set of explanatory variables has been used in all the four models, the results are interpreted independently.

As mentioned earlier, the present study employed altogether 424 households among the six districts of Bangladesh. The criteria of the respondents in terms of their participation status for the four groups are as follows. In the data set of sample group (1), there have been 232 (55%) responded as participated before and 192 (45%) are never participated in MFIs. This means that there are 55 percent borrowers are dropouts and about a half of the sample population is nonparticipating in the study areas.

In sample group (2), 144 (34%) individuals are presently participating in MFIs and 280 (66%) are nonparticipating in any MFIs. In sample group (3), 240 (56%) individuals responded to be willing to participate in MFIs in future and 184 (44%) individuals responded to be unwilling to participate in future.

For identifying the factors that affect the participation behavior of the rural poor in MFIs, the logistic regression equation was set as below:

$$Y_i (i=1,2,3) = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15})$$

Where,

$Y_1$  (Model 1): dummy variable, 1 for participated in MFIs before, 0 otherwise

$Y_2$  (Model 2): dummy variable, 1 for who are participating in MFIs, 0 for nonparticipants

$Y_3$  (Model 3): dummy variable, 1 for who are willing to participate in MFIs, 0 otherwise

$X_1$ : Sex

$X_2$ : Age

$X_3$ : Marital Status

$X_4$ : Education

$X_5$ : Yearly household income

$X_6$ : Total amount of land including homestead area

$X_7$ : Value of other assets

$X_8$ : Fear of getting into risk of borrowing from MFIs

$X_9$ : Individual preference for borrowing

$X_{10}$ : Religious leaders' lecture on borrowing from MFIs

$X_{11}$ : Spousal dislike as female head of household

$X_{12}$ : Friends' advice on borrowing from MFIs

$X_{13}$ : Insufficiency of resources

$X_{14}$ : Lack of knowledge in business

$X_{15}$ : Ill-health or vulnerability to crises

## Results and Discussion

There has been a common belief among the microfinance activists and researchers that all individuals are free to choose whether to participate in MFIs and that participation is self-selective (Pitt and Khandker, 1995). In this respect, Mahmud (2000) is naïve to argue that the rural individuals do not enjoy such freedom to join in MFIs because the choice is not entirely free. There have been myriads of household level differences among participating and nonparticipating individuals which suggest that potential client-related factors influence the decision to participate in MFIs.

**Table 2:** Results of Logistic Estimation on Participation in MFIs

| Explanatory Variables | Model 1               |            | Model 2               |            | Model 3               |            |
|-----------------------|-----------------------|------------|-----------------------|------------|-----------------------|------------|
|                       | Coefficient estimates | Odds ratio | Coefficient Estimates | Odds ratio | Coefficient estimates | Odds ratio |
| Gender                | -.940***              | .391       | -1.299***             | .273       | -.698***              | .498       |
| Age                   | -.289*                | .749       | -.464**               | .629       | -.046                 | .955       |
| Marital status        | -.367                 | .687       | -.046                 | .955       | .069                  | 1.858      |
| Education             | .512***               | 1.669      | .612***               | 1.844      | .529***               | 1.697      |
| Yearly income         | -.207**               | .813       | -.271**               | .762       | .246**                | 1.279      |
| Land                  | -.028                 | .973       | -.287**               | .750       | -.278**               | .757       |
| Other assets          | .251***               | 1.285      | .375***               | 1.455      | .137*                 | 1.147      |
| Fear                  | .195                  | 1.215      | .281*                 | 1.325      | .468***               | 1.597      |
| Preference            | .024                  | 1.024      | -.074                 | 1.077      | .827***               | 1.286      |
| Religion              | -.509***              | .601       | -.863***              | .422       | .301**                | 1.351      |
| Spousal dislike       | .407***               | 1.503      | .337**                | 1.401      | .069                  | 1.072      |
| Friends' advice       | -.196                 | .822       | .089                  | 1.093      | -.028                 | .972       |
| Resources             | -.124                 | .883       | -.084                 | .920       | -.506***              | .603       |
| Knowledge             | -.069                 | .933       | -.398***              | .672       | -.480***              | .619       |
| Ill-health            | -.122                 | .885       | .052***               | 1.053      | .054                  | 1.055      |

|                         |             |              |              |
|-------------------------|-------------|--------------|--------------|
| Correctly predicted (%) | 76.30       | 75.90        | 74.8         |
| -2 Log Likelihood       | 493.444     | 410.633      | 456.737      |
| Model Chi-Squares (Sig, | 90.560(000) | 132.753(000) | 123.634(000) |

Note: \*\*\* = significant at 1% level; \*\* = significant at 5% level; \* = significant at 10% level

The estimation results of the three different models specified above have been presented in Table 2. The model chi-squares (90.560, 132.753 and 123.634) for the all three models and the significance level of 0.000 indicate that null hypothesis that the coefficients of all the variables in the model are zero can be rejected at better than 99 percent level. In the first model, seven variables excluding constant are found statistically significant and the model on the whole can predict 76 percent of the cases correctly.

In the second and the third model, among the fifteen explanatory variables, eleven are found statistically significant to affect the odds and the models on the whole can predict about 75 percent of the cases correctly. Estimated coefficients of the variables pertaining to presently nonparticipating or past-participants, current-participants and willing-nonparticipants' characteristics reveal a number of interesting aspects of participation and nonparticipation of the rural poor in Bangladesh.

In these three sets of models, where the three dependent variables are distinguished on the basis of nonparticipation or participation in the past (i.e. drop-out), participation at present and nonparticipation at present but willing to participate in the future, the study aims to identify the factors that determine the participation of the rural poor individually in MFIs. This is the reason for including the explanatory variables that reflect member-specific characteristics such as gender, age, general literacy level and occupational status. Several past studies incorporated similar demographic variables in explaining the dependent variables (see e.g. Zohir, 2001; Mahmud, 2000).

The estimates of the Model 1 (for who are presently nonparticipants or drop-out) indicate that if an individual is female, the odds for the person willing to participate in the MFIs reduce by 60 percent. Relatively younger people are more willing to participate with a year rise in the age of the nonparticipants or drop-outs, the odds ratio reduces by 25 percent. However, for relatively more educated individual, the odds ratio increases by 66 percent that the person being nonparticipant or drop-out. In the case of the parameter of yearly income, the odds appear to decrease the probability of nonparticipation in MFIs by 19 percent. The odds ratio of other assets also increases the probability of nonparticipation by 28 percent. These outcomes are supported by several past studies (Zohir, 2001; Mahmud, 2000). Hence, in order to

increase participation, MFIs should include wide range of aged groups of people in society. Besides, more training ought to be provided by the MFIs to the illiterate poor for better knowledge and understanding of business skills. By this way, people would be more productive and can have better skills to attain more profit in their business. This will increase their income which would ease to pay back their regular installment of loans and in effect, it will reduce the drop-out rates from the MFIs.

For religion, the odds indicate that nonparticipation by the rural poor in MFIs decreases by 40 percent. Religious restrictions in Islamic religion such as interest on borrowed funds as well as *purdah* for women are important consideration for participating in MFIs. The results of this study reflect similar fact of the Muslim society of Bangladesh (Ashraf, 2013; Ahmed, 2009; Dyal-Chand, 2007). The variable of spousal dislike also appears to indicate that its odds of nonparticipation increases by 50 percent. This result implies that gender, age, education, income level as well as religious restrictions are important consideration in explaining the participation as well as nonparticipation in MFIs (Zohir, 2001; Mahmud, 2000). For overcoming the religious problems, there is no other way except the introduction of Islamic MFIs. There have already been several Islamic MFIs working in Bangladesh such as Al-Falah, Nobel, Rescue and Rural Development Scheme of the Islami Bank Bangladesh Limited. These Islamic MFIs have better participation of the rural poor and drop-out rates are comparatively less than conventional MFIs (Mannan, 2010; Ahmed, 2002).

The estimates of the Model 1 (for nonparticipants and who participated in MFIs before) indicate that there is a positive relationship between education, other assets and spousal dislike and the probability of the individual reporting that they never participated in MFIs before. The significance levels of 0.000 associated with these three variables indicate that there has been almost zero percent chance that the values of the coefficients are not significantly different from zero, i.e. there is about 100 percent chance that the coefficients of these variables are different from zero.

This outcome implies that these variables may cause the individuals to induce them to have the membership of the MFIs before. In relation to the positive influence of the variable of spousal dislike to female head of

household on the probability of participation before, earlier literature suggested that the female members whose family ties are contentious with their husbands are more prone to participate in MFIs than those who do not have such conflicts in the family (Ashraf, 2013; Karim, 2011). Nevertheless, the rural women who are single, widows or divorced or separated head of the family have more probability to take part in microfinance activities than those who have a good bond in the family (Zohir, 2001). In this context, only solution to this type of problem is to provide better education and training to the rural poor. In contents of the training, social and ethical values should also be incorporated which can improve the morality of the people as well mitigate the family problem to certain extent.

Based on the significance of the variables in the fitted Model 1 (Table 2), it can also be portrayed that there have been potential negative association with gender, age and religion which are observed to be highly significant to influence negatively the participation of individuals who participated in MFIs before and never participated in MFIs. This result is supported by similar other study as well (Khandker, Koolwal and Sinha, 2008). There are other variables which are not significant to influence the participation behavior of the rural poor, but these coefficients indicate that these appear not to be potential barriers of participation in MFIs.

The estimated values of model 2 (for the poor who are presently participating in MFIs) demonstrate that eleven variables excluding intercepts are statistically significant in influencing the participation of the rural poor in the study areas. Among them, the odds ratios of education, other assets, fear of getting into risk of loans, spousal dislike to female head of household and ill-health increase the probability of participation of the rural poor in MFIs by 85 percent, 45 percent, 32 percent, 40 percent and 5 percent respectively.

Hence, the potential problems of participation for the model 2 are gender, age, yearly income, land, religion and lack of knowledge. This means that these are robust factors that inhibit the actual behavior of microfinance participation of the rural poor in the study areas. These outcomes are also supported by several past studies (Ashraf, 2013; Ferdous and Uddin, 2010; Ahmed, Narayan and Zaman, 2009; Khandker, Koolwal and Sinha, 2008).

The estimated figures of model 3 (for who are willing to participate in MFIs) show that eleven factors are appeared to be statistically significant to influence the participation of the rural poor who are presently nonparticipants and willing to participate in MFIs (Table 2). There have been four variables whose coefficients are associated with negative sign and those variables are gender, land, resources and lack of knowledge. Similar results are also obtained in several past studies (Zohir, 2001; Mahmud, 2000).

Other seven factors have positive sign associated with their coefficients. This means that the factors, which exhibit negative signs, are prohibiting the poor's willingness to participate in MFIs. Other sevens are influencing positively to be willing to participate in MFIs. The results of the model 3, thus, indicate that gender, amount of land, inadequate resource base and lack of required business knowledge are inhibiting willingness to participate in MFIs. So, in order to increase participation in MFIs, it is imperative to consider these variables.

## **Conclusion**

The present research endeavors to identify the potential barriers to participation of the rural poor in MFIs in Bangladesh. The study employed three models such as model 1, model 2 and model 3. For the model 1, the dependent variable is nonparticipation or drop-out from the membership in MFIs. For the model 2, the dependent variable is participation in MFIs and in the model 3, the dependent variable is nonparticipation and willing to participate in MFIs.

The study postulated eight explanatory variables apart from seven demographic factors in order for determining the potential barriers. The logistic regression analysis results into different determinants that influence the participation behavior of the rural poor. Among the seven demographic variables, gender, age, education, yearly income, land and other assets appear to be common determining factors of participation for the aforementioned three models of analysis.

In other eight explanatory variables, only four variables are observed to be common statistically significant variables to hinder the participation of the rural poor in MFIs in Bangladesh. Similar results are also

available in other studies such as Zaman (1997), Zohir (2001) and Mahmud (2000).

Hence, in order to increase the participation of the rural poor in MFIs with an ultimate objective of alleviating rural poverty, the policy planner must focus on the identified variables which inhibit the rural poor participation in MFIs in Bangladesh. If the microfinance programs are to serve the interests of the rural poor in society, certain institutional features may have to be changed in order to remove the barriers to participation in MFIs. Such as high cost of loans, membership criteria and weekly repayment system ought to be relaxed. Last but not least, the program must focus the strategy to maximize the welfare of the rural poor rather than the commercial motive of the MFIs.

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## **The Efficiency of Zakat Collection and Distribution: Evidence from Two Stage Analysis**

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Since its corporatization, the collection of zakat by Lembaga Zakat Selangor has increased from RM13.8 million in 1991 to RM336.8 million in 2010. However, some quarters have voiced concerns over the efficiency of zakat collection and distribution. Therefore, this study attempts to analyze the efficiency of zakat management of Lembaga Zakat Selangor. The Annual Report data for Lembaga Zakat Selangor between 2001 and 2011 were devised. This paper utilizes the two stage linked Data Envelopment Analysis model, as proposed by Berber et al (2011). The findings show that: first, both collection and distribution have lagging resources that is referred to technical efficiency. Second, the result shows a lower efficiency in distribution than in collection function. Third, from the overall efficiency, allocative and cost efficiency scores show maximum efficiency is achieved almost every year. It reveals that Lembaga Zakat Selangor is utilizing its input proportionately to ensure minimum cost incurred to produce a given output (amount collected and amount distributed) at a given input prices (cost collection and cost distribution).

### **Introduction**

The institution of zakat has seen its share of controversies. Although zakat governing bodies are deemed to be run by people of religious background, who are expected to be righteous and God-fearing, the misappropriations usually surface now and then. The questions were raised on the efficiency of zakat management, especially when the zakat collections continue to increase every year. Zakat institutions in Malaysia collected a total of more than RM1.3 billion in 2010 alone (Pusat Pungutan Zakat Annual Report 2010; page 82). Despite the

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increases in collection, the number of zakat contributors is still relatively low. For example, in 2010, Lembaga Zakat Selangor (LZS), zakat on income was contributed by 142,029 contributors in Selangor (PPZ Annual Report 2010). Lembaga Zakat Selangor has been chosen for this study due to the first Zakat body that was corporatized in 1994.

Considering there are more than half of the 5.4 million population are Muslims (2010 estimates per Department of Statistics), this number is minimal, even if we take into account the number of asnafs who are eligible to receive instead of paying zakat. Such statistics puts doubt in the mind of the public if LZS has done enough to improve on the collections. In addition, the perception that the distribution of zakat is inefficient has been reported in a many empirical studies. It was also found that the issues in both collection and distribution is interrelated in a vicious circle that the perception of zakat is distributed efficiently to be a motivating factor for Muslims to pay zakat.

Being a compulsion in Islam, the efficient management of zakat is crucial not only in ensuring that the funds are properly utilized as entrusted by those who contributed into it, any discrepancies (perceived or actual) in its management will blemish the good name of Islam. Therefore, it is important to provide evidence of efficient utilization of resources by Lembaga Zakat Malaysia in discharging their duties of collecting and distributing zakat. The importance of Zakat in Islam is so much emphasized that it is mentioned more than a hundred times in the Qu'ran, and more often than not in conjunction with the call to establish prayers (Solat).

In addition, the perception that the distribution of zakat is inefficient has been reported in a few empirical studies such as was done by Mohamed Dahan, (1998); Muhammad Syukri, (2006); Anuar Muhammad (2008); and Abdul Halim et al. (2008). It was also found that the issues in both collection and distribution is interrelated in a vicious circle that the perception that zakat is distributed efficiently was found to be a motivating factor for Muslims to pay zakat (Sanep & Hairunnizam, 2004). In view of these problems, this paper aims to analyse the technical, allocative and cost efficiencies of zakat collection and distribution.

**Lembaga Zakat Selangor (LZS)**

Corporatisation of zakat management in the state of Selangor began when the Selangor Islamic Religious Council (MAIS) established the Pusat Zakat Selangor (PZS) or previously known as Pusat Pungutan Zakat MAIS (MAIS Zakat Collection Centre) on February 15, 1994. PZS is a private limited company registered with the name, Zakat MAIS Sdn Bhd, a wholly owned subsidiary of MAIS with a paid up capital of RM500, 000. PZS was established with the intention to improve the governance of zakat and to inculcate professionalism in the management of zakat at par with the management practices in the corporate world. Henceforth, PZS was given the full mandate for the management of zakat collection in Selangor.

In 1998, MAIS widened the mandate to PZS to also manage the distribution of zakat. This is to ensure that all zakat in the state management function is housed under one institution, freeing MAIS to focus on other crucial areas of Muslims welfare, such as the development of waqf property, inheritance and etc. The change of name from PZS to Lembaga Zakat Selangor (LZS) was inaugurated by Sultan of Selangor on 31 January 2006. This transformation is to provide a new outlook for PZS in the management of zakat collection and distribution, that have reached RM100 million a year. This change brought with it, a greater sense of responsibility and commitment, not only in terms of collection and distribution of zakat, but also in the improvement of customer service and overall organization.

LZS was established under the Trustee Act (Incorporation) Act 1952 through a Deed of Trust which is registered in the Legal Division of the Department of the Prime Minister. LZS is administered through the Board of Trustees appointed by MAIS and is currently comprises ten members of a combination of religious, academic, corporate and professional sectors. In order to strengthen the management and operation of LZS, the Board of Trustees has established six committees with specific portfolios, each chaired by a member of the Board of Trustee. These committees are made up of a mixture of members of the Board of Trustee and experts from outside LZS. The six committees are Zakat Collection Operations Committee, Zakat Distribution Operations Committee, Nomination and Remuneration Committee, Audit Committee, Finance Committee and Tender Committee.

Since its inception, LZS showed impressive increase in the collection of zakat. From a collection of around RM7 million in 1994, LZS zakat collection in 2009 has reached RM283.7 million from 155,000 contributors. For 2010, total collection was RM336.9 million and the number of contributors increased to 168,000. As for distribution, the amount distributed in 1994 was RM14 million. In 2010, RM330.4 million was distributed to more than 110,000 recipients.

### **Literature Review**

The concept of Zakat being as a social institution and an instrument to improve the Muslims socio-economic welfare has been acknowledged. The establishment of Zakat Collection and Distribution Units and the appointment of Zakat officials at every State level to implement Zakat rules and regulations were the first project to make zakat as a social institution (Shawal, 2011). However, there is no standardization of managing zakat across the states in Malaysia (Shawal, 2011). States have the authority to practice and implement different zakat rules and regulations. Since the 1990s, as the number of contributors increase whether from corporations, co-operative bodies, NGOs and individuals, several state religious bodies see it necessary to decentralize and privatize the Zakat management, encompassing its collection and distribution to the ordained beneficiaries. Kahf (1989) studied on what are the items of wealth that can be imposed zakat upon during the lifetime of Prophet Mohammad and suggests that zakat can achieve its objective of eradicating poverty in the Muslim world more quickly if income derived from industrial, commercial and financial income from corporate bodies are made zakatable.

In another study, Buang (2000) laid out the basic principles of zakat management (based on the Qu'ran and Hadiths, and fatwas). Further, Bakar and Rahman (2007), made the distinction between zakat and taxation and the imposition of zakat and taxation in Malaysia. Yet, another study by Rahman (2007) looked into the effective integration of zakat into mainstream Islamic financial system in Malaysia, laying down the pre-requisites for such integration which include the objective and fair measurement of business wealth for zakat purposes, standardizing zakat accounting practices and development of appropriate performance measures.

Shehata (1994) studied the rules that govern the utilization of zakat, what are the expenditures allowed using zakat funds, who are entitled to it and the distribution of zakat among the eight types of beneficiaries (asnafs). Another study on level of compliance among Muslim employees was done by various scholars. For example, Idris and Ayob (2002) and Nor et al. (2004). Idris and Ayob (2002) found that the attitude of employees towards zakat governance and knowledge of zakat influence compliance. Nor et al. (2004) revealed that level of religious faith (iman) and religious education influence compliance.

Wahid et al. (2005) showed that gender, age of the respondents, marital status, income and expenses of the respondents were significant factors influencing zakat payment. Of late, there have been allegations of inefficiencies in the governance of zakat. Ahmad et al. (2006) used logistic regression to analyse the probability of payment of zakat against factors contributing to dissatisfaction of zakat contributors and found that 57% of respondents were dissatisfied with the distribution of zakat by zakat Institutions. This finding was also supported by Muhammad (2008) which found a positive relationship between perception on the distribution of zakat by zakat institution. While studies by Wahid et al. (2008, 2009) identified that the two main factors contributing to dissatisfaction are the ineffectiveness and the lack of transparent information on zakat distribution.

A study on the performance of zakat distribution in Malaysia, by Abd Halim et al. (2005) was mentioned in length about the efficiency and effectiveness issues among the Zakat Institution in Malaysia. The study stated the percentage of zakat distribution of the states in Malaysia for the year 2000. Demographic factors was the main influence on the distribution of zakat in the states between the beneficiaries that is namely asnafs the poor and fisabilillah (on the path of Allah). Amil (collector of zakat) distribution was noted to be a big gap between 11% and 26%. The study also proposed a framework to show performance of the zakat distribution.

From the economic point of view, according to Kahf (1997), zakat could affect the aggregate supply in three ways: supply of labour, supply of capital and resource allocation. The funds from zakat can be channeled to the improvement of the health, nutrition and other living conditions of the poor, thus, increasing the availability of labour and improve

efficiency of productivity. Subsequently, the supply of goods produced in the economy will also increase.

Efficiency generally refers to the rate of output, compared to the input processed by a system. In economic context, efficiency describes the ability of a system in generating the maximum desired outputs from the constrained inputs using the available technology. Therefore, efficiency improves when output increases, while inputs remain the same or reduced. An economic system is efficient if it can provide more goods and services, without having to seek out more than the available resources. Efficiency measurement model were first introduced by Farrell (1957), consisting two components, Technical Efficiency and Allocative Efficiency. Technical Efficiency reflects the firm's ability to obtain maximum output from a given set of inputs, and Allocative Efficiency reflects the firm's ability to use the inputs in optimal proportion based on given prices and production technology. According to Leibenstein (1966), efficiency, in terms of operations is, when people and organizations normally work neither as hard nor as effectively as they could.

Study done by Norazlina and Abdul Rahim (2012), is to analyze the efficiency of zakat institutions in Malaysia by using data envelopment analysis (DEA) method to estimate zakat efficiency and Tobit model to determine the efficiency of zakat institution in Malaysia. Technical efficiency, pure technical efficiency and scale efficiency of DEA model being used. The empirical findings suggest that zakat payment, computerized zakat system, board size, audit committee and decentralization significantly affect the efficiency of zakat institutions in Malaysia. The analysis showed that fully corporatized zakat institutions are positively associated with efficiency of zakat institutions in Malaysia while partially corporatized negatively affect zakat efficiency.

Sarker and De (2004) used DEA (Data Envelopment Analysis) on measure farming efficiency based on the different farm sizes and tenures. Choosing labour costs as input and the various crops, credit, marketing products and agricultural extensions as outputs, the study yielded that most of the farms are efficient, but small farms are found to be more efficient than larger farms. Norazlina & Abdul Rahim (2011), in their framework to analyse the efficiency and governance of zakat institutions by using the DEA. They argued that the characteristics of

DEA are suitable for application to zakat institutions, as it was successfully applied as indicator for efficiency of non-profit and public sectors. Further, Norazlina & Abdul Rahim (2012) measure the productivity growth of zakat institutions by using the variable returns to scale (VRS) and they found that most of zakat institutions were operating at non-CRS (Constant Return Scale). Thus, they need more improvements by zakat institutions to improve the overall of efficiency. However, in their work, their study of efficiency seemed to focus on technical efficiency and scale efficiency.

Nur Hafizah and Selamah (2013) analyze the profile of zakat collection institutions and the efficiency of the institutions in collecting the zakat by using Data Envelopment Analysis (DEA) approach. The study conducted in the three states of Federal Territories including Kuala Lumpur, Putrajaya and Labuan. The results of the efficiency found that all of the three areas of zakat institutions are efficient. The overall finding indicate that the center managed by Federal Territories maintain their performance and able not only to increase the total of zakat collections but also number of new and existing zakat payers.

A zakat institution is, thus, akin to a non-profit organization in its functionality. Berber et al. (2011) suggested a two stage DEA analysis in measuring the efficiency of non-profit organization. The stage one measures the efficiency of fund-raising and the stage two measures the delivery of service (in our case the distribution of zakat to the beneficiaries). The output of stage one is included in the input of stage two. Berber et al. (2011) found that the separation of the fundraising function from product delivery function will show a clearer analysis of efficiency, as both efforts of fund raising and service delivery (distribution) are equally important. Hence, this study will follow the framework from Berber et al. (2011) to measure the efficiency of zakat management.

## **Methodology**

### **The Model**

In this study the efficiency model is constructed by combining the model introduced by Berber et al. (2011) and Norazlina & Abdul Rahim (2011). The efficiency of Lembaga Zakat Selangor will be tested by

using the two stage linked DEA (Data Envelopment Analysis) model. In stage one, the zakat collection expenses and other collection effort variables are considered as input and the collection amount as output. In the second stage the collection amount is added as input to the other distribution variables and the distribution amount as output.

### **Data Envelopment Analysis (DEA)**

Lovell (1996) identified three techniques for the measurement of efficiency of producers, namely, Deterministic Frontier Analysis (DFA), Stochastic Frontier Analysis (SFA), and Data Envelopment Analysis (DEA). Lovell finds that DFA and DEA achieved a more satisfactory reorientation towards productivity measurement compared to SFA.

DEA, as defined by Talluri (2000), is a multi-factor productivity analysis model for measuring the relative efficiencies of a homogenous set of decision making units (DMUs). DMUs can be anything from an individual or cost/profit centre to a whole organization. For this study, the DMUs will be the state of efficiency of one entity at different points of time.

The efficiency score in the presence of multiple input and output factors is defined as:

$$\text{Efficiency} = \frac{\text{weighted sum of outputs}}{\text{weighted sum of inputs}}$$

In applying DEA, the basic assumption is that, if one DMU can produce Y of output utilizing X of input, then, other similar DMUs is expected to perform at the same level, if they are efficient. However, since there are many DMUs, there will be varying levels of outputs, using varying levels of inputs. Taking the outputs against inputs of all the DMUs, we can generate a composite DMU (known as a virtual or dummy DMU), that will be the benchmark in assessing the real DMUs. DEA attempts to identify which of the DMUs are most efficient and point out specific inefficiencies in the other DMUs.

DEA uses mathematical programming to locate an “efficiency frontier” that enables an evaluation of the efficiency level for each DMU. DMUs

that do not fall on the efficiency frontier are therefore deemed inefficient.

The model can be presented in equation form:

$$\begin{aligned} \text{Max } h_0(u, v) &= \frac{\sum_{r=1}^s v_r y_{r0}}{\sum_{i=1}^m u_i x_{i0}} \\ \text{Subject to: } &\frac{\sum_{r=1}^s v_r y_{rj}}{\sum_{i=1}^m u_i x_{ij}} \leq 1 \text{ for } j = 0, 1, \dots, n \\ &u_i \geq 0 \text{ for } i = 1, 2, \dots, m \\ &v_r \geq 0 \text{ for } r = 1, 2, \dots, m \end{aligned}$$

Where;

$x_{ij}$  = the amount of input  $i$  utilized by the  $j$ th DMU

$y_{rj}$  = the amount of output  $r$  produced by the  $j$ th DMU

$u_i$  = weight given to input  $i$

$v_r$  = weight given to output  $r$

$j$  = number of DMUs

To further develop into DEA, we will have to look at the different concepts of efficiency as defined by Farrell (1957). Technical efficiency is the most common concept, i.e. the ability to utilize physical inputs (e.g. manpower and machines) to produce outputs optimally, without any wastages. A firm operating at “best practice” is 100% technically efficient. The size of the operations and managerial practices affect technical efficiency. Allocative efficiency provides the indication that the organization is utilizing its input proportionately to ensure minimum cost incurred to produce a given output at a given input prices. Finally, cost efficiency is a combination of both technical and allocative efficiency. It is calculated as the product of technical and allocative efficiency; which means, that an organization can only be cost efficient if it is both technically and allocatively efficient.

This study separates the collection function from the distribution function, as recommended by Berber (2011). In the first stage, the study evaluates the efficiency of zakat collection, considering the number of Amils employed (represented by  $Am$ ), the number of branches (represented by  $Br$ ), the number of Banks who act as collection agent

(AgB) and the expense incurred in collecting zakat (CE) will be the input, and the amount of zakat collected (ZC) will be the output. This can be expressed as:

$$ZC = f_1 (Am, Br, AgB, CE)$$

Subsequently, using the zakat collection amount as input, the second stage of our efficiency evaluation is on the distribution of zakat. In this second stage, we included the distribution expenses (DE) and number of staff (St) as additional inputs in producing the output that is the zakat distribution are included., thus;

$$ZD = f_2(ZC, DE, St)$$

This process is depicted below:

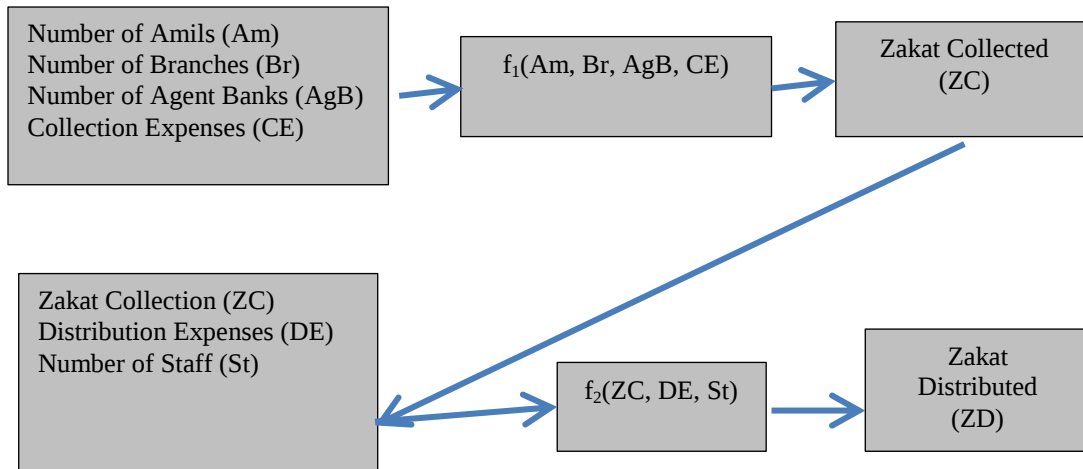


Figure 1: Two-Stage Process in Measuring Efficiency

Therefore, in measuring efficiency, the theoretical framework as follows (Figure 2 to Figure 4).

For collection efficiency, (using the DEA Excel solver, (Zhu, 2003), first, the study will measure technical efficiency of zakat collection by taking the physical inputs and measure this against the output, which in this first stage is the zakat collection. Then, the test for allocative efficiency, by taking the monetary input and compare it to zakat

collection as output will be carried out. Finally, for this first stage, both the physical and monetary input and measure this against zakat collection will be combined to give the cost efficiency scores.

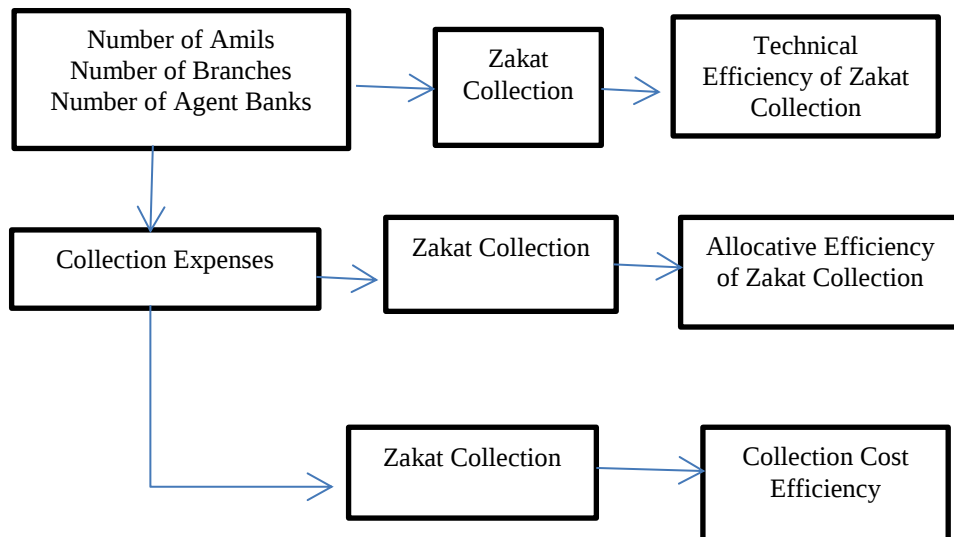


Figure 2: Theoretical Framework of Zakat Collection Efficiency

For distribution efficiency, the same process is repeated; however, in measuring allocative and cost efficiency, the zakat collection (which is the output in the first stage framework above) is included as input and measured against zakat distribution as output. This is illustrated in figure 3.

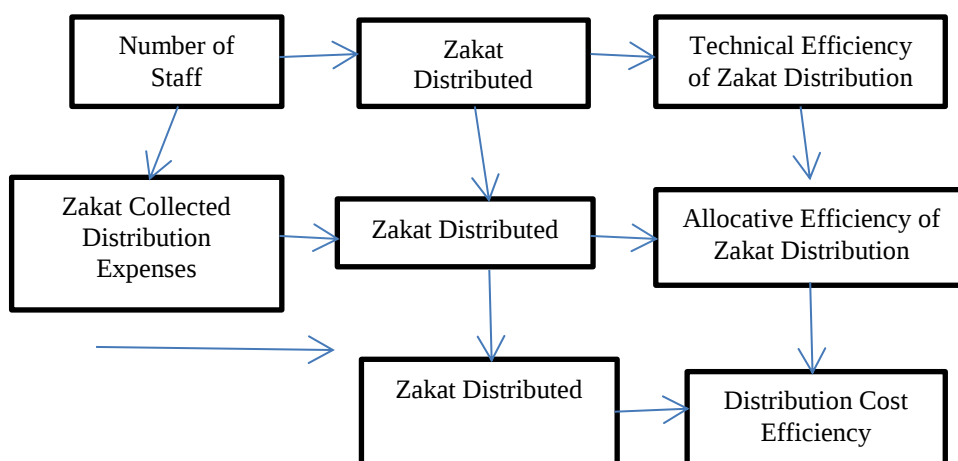


Figure 3: Theoretical Framework of Zakat Distribution Efficiency

As a means for comparison we will also run the data on an overall basis, where all the physical and monetary resources will be used as input to measure against both zakat collection and distribution as outputs. The processes will be similar to the first and second stage measure where we will test for technical, allocative and cost efficiency as illustrated in figure 8 below.

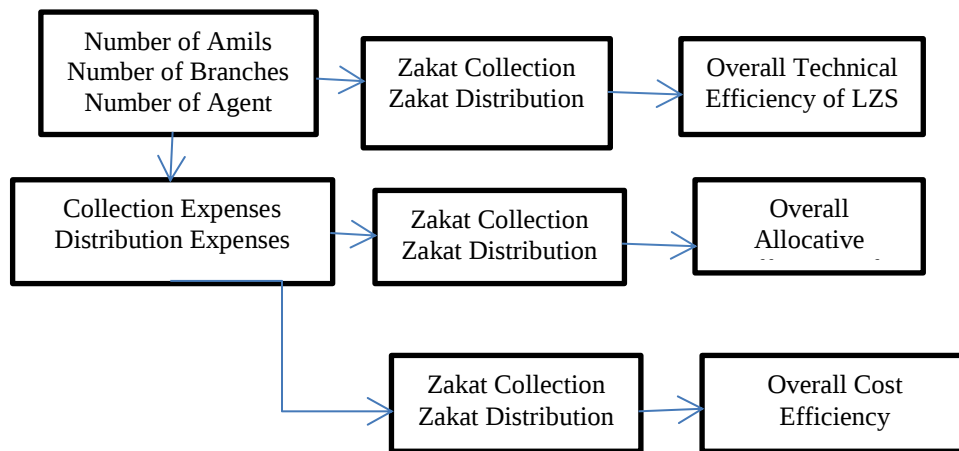


Figure 4: Overall Efficiency Framework

The above frameworks are based on a combination of previous studies. However, this research substituted the variables with proxies which are more relevant to study, which are listed in table 1 below.

The core reference for this study is the work of Norazlina & Abdul Rahim (2011) and Berber et al. (2011). Therefore, the proxies for the variables in this study are identified as follows:

**Table 1:** Variable Proxies

| Variable                         | Proxy                                    | Research by                                       |
|----------------------------------|------------------------------------------|---------------------------------------------------|
| <b>Input</b>                     |                                          |                                                   |
| Number of Amil/Number of Staff   | Labour                                   | Sarker and De (2004)<br>Ibrahim and Salleh (2006) |
| Number of Branches               | Number of Branches                       | Norazlina & Abdul Rahim (2011)                    |
| Number of Agent Banks            | Number of Branches                       | Norazlina & Abdul Rahim (2011)                    |
| Collection/Distribution Expenses | Fund Raising/General Management Expenses | Berber et al. (2011)                              |
| <b>Output</b>                    |                                          |                                                   |
| Zakat Collection                 | Contribution Received                    | Berber et al. (2011)                              |
| Zakat Distribution               | Programme Service Delivered              | Berber et al. (2011)                              |

### The Data

The data obtained for this study were for 11 years from 2001 to 2011 from the annual report of LZS and also from their website [www.e-zakat.com.my](http://www.e-zakat.com.my). To measure LZS's efficiency of collection, this study identified the variables to be the number of Amils, number of branches, number of agent banks and the cost of collection (the portion taken by Amil as an asnaf). Table 2 depicts the efficiency calculation employed in this study whereby utilization is calculated as a percentage of input.

**Table 2:** Efficiency Calculation

| Year | Total Input | Amil (%) | Branches (%) | Agent banks (%) | Total |
|------|-------------|----------|--------------|-----------------|-------|
| 2001 | 200         | 87.50    | 9.00         | 3.50            | 100   |
| 2002 | 202         | 87.13    | 8.91         | 3.96            | 100   |
| 2003 | 210         | 87.14    | 9.05         | 3.81            | 100   |
| 2004 | 215         | 86.05    | 9.30         | 4.65            | 100   |
| 2005 | 211         | 85.31    | 9.48         | 5.21            | 100   |
| 2006 | 216         | 84.72    | 10.19        | 5.09            | 100   |
| 2007 | 267         | 86.89    | 8.24         | 4.87            | 100   |
| 2008 | 274         | 86.86    | 8.03         | 5.11            | 100   |
| 2009 | 323         | 88.85    | 6.81         | 4.33            | 100   |
| 2010 | 335         | 88.66    | 6.87         | 4.48            | 100   |
| 2011 | 397         | 90.18    | 6.05         | 3.78            | 100   |

The portion taken by amil is not only used to pay those who act collectors of zakat, but LZS's itself is considered an amil and thus, the amil portion is also used for the administration (including salaries of LZS employees), sales and promotion, research and development, to list a few utilisation of the portion. However, due to the reticence of LZS, the researchers were not given access to the details of the various expenditures. As such, for the purpose of this study, the whole amount is taken as amil's portion as an input in the effort of getting zakat collections. For efficiency of distribution, the inputs were identified to be the amount collected, the cost of distribution (which include costs of holding ceremonies where zakat were distributed to the asnafs and the number of staff manning the distribution department of the LZS. The actual amount distributed is the output. Table 3 depicts the descriptive statistics of the inputs and output employed in this study.

**Table 3:** Descriptive Statistics of the Inputs and Output used in the DEA model

|                    | Mean   | Median | Maximum | Minimum | Std. Dev. |
|--------------------|--------|--------|---------|---------|-----------|
| <b>Input</b>       |        |        |         |         |           |
| Agent Banks        | 11.45  | 11.00  | 15.00   | 7.00    | 2.94      |
| Branches           | 20.91  | 22.00  | 24.00   | 18.00   | 2.02      |
| Collection Expend. | 25.56  | 20.06  | 49.20   | 5.24    | 11.78     |
| No. of Amils       | 226.73 | 185.00 | 358.00  | 175.00  | 62.41     |
| <b>Output</b>      |        |        |         |         |           |
| Total Collection   | 209.23 | 159.84 | 393.50  | 126.99  | 92.94     |

Table 3 reveals a wide range between the minimum and the maximum amount of inputs used and output produced by LZS. This scenario happened as the state of Selangor has different districts with different size of populations. Eventually, LZS has been using different quantity of input in their operation.

## Findings

### DEA Results

The data collected have been processed in a two staged analysis using Data Envelopment Analysis (DEA). Stage 1 is to test the LZS's efficiency in collecting Zakat and stage 2 tested the efficiency of distribution. In addition, DEA is run using all the data to test on the overall efficiency of LZS. Using the DEA Excel Solver, the data are run and the result would either be 1.000 which means full efficiency or less than 1.000 which represent inefficient result. The efficiency scores obtained for collection and distribution of Zakat by LZS are as follows.

### Collection Efficiencies

**Table 4:** DEA Result for LZS Collection Efficiencies

| <i>Collection Efficiency</i> |           |            |         |
|------------------------------|-----------|------------|---------|
| Year                         | Technical | Allocative | Cost    |
| 2001                         | 0.69153   | 0.97679    | 0.99077 |
| 2002                         | 0.70393   | 0.97679    | 0.98700 |
| 2003                         | 0.70103   | 0.97679    | 0.98915 |
| 2004                         | 0.64255   | 0.97679    | 0.97679 |
| 2005                         | 0.68067   | 0.97679    | 0.97679 |
| 2006                         | 0.76990   | 0.93392    | 0.94403 |
| 2007                         | 0.76823   | 1.00000    | 1.00000 |

| <i>Collection Efficiency</i> |         |         |         |
|------------------------------|---------|---------|---------|
| 2008                         | 0.90545 | 0.94272 | 0.98152 |
| 2009                         | 0.87708 | 0.97835 | 1.00000 |
| 2010                         | 1.00000 | 0.93772 | 1.00000 |
| 2011                         | 1.00000 | 0.93748 | 1.00000 |

Table 4 shows the result of running the stage one data through the DEA software. LZS was found to be technically efficient in 2010 and 2011, and was least efficient in 2004. The input variables showed a steady increase from 2001 to 2011, except for a jump in the number of amils in 2004 and a reduction in collection amount. This contributed to the lowest efficiency score in 2004. Allocative efficiency was achieved in 2007, otherwise the results showed a rather consistent allocative inefficiencies within the period under review. 2007 is deemed to be the benchmark for efficiency as it has the highest output for each unit of input. The same consistency can be seen in the cost efficiency result, however, LZS was 100% cost efficient in 2007, 2009, 2010 and 2011.

### **Distribution Efficiencies**

**Table 5: DEA Results for LZS Distribution Efficiencies**

| <i>Distribution Efficiency</i> |           |            |         |
|--------------------------------|-----------|------------|---------|
| Year                           | Technical | Allocative | Cost    |
| 2001                           | 0.55450   | 0.86399    | 0.86399 |
| 2002                           | 0.61143   | 0.88178    | 0.88178 |
| 2003                           | 0.55794   | 0.81317    | 0.81317 |
| 2004                           | 0.53737   | 0.83350    | 0.83350 |
| 2005                           | 0.59008   | 0.86399    | 0.86399 |

| <i>Distribution Efficiency</i> |         |         |         |
|--------------------------------|---------|---------|---------|
| 2006                           | 0.66642 | 0.86268 | 0.86268 |
| 2007                           | 0.67627 | 0.87734 | 0.87734 |
| 2008                           | 0.71391 | 0.78581 | 0.78658 |
| 2009                           | 0.87455 | 1.00000 | 1.00000 |
| 2010                           | 1.00000 | 0.99664 | 1.00000 |
| 2011                           | 0.93341 | 0.96015 | 0.96268 |

Table 5 shows the distribution efficiencies. LZS's technical efficiency was 100% in 2010, and was least efficient in 2004. Again, as per the technical efficiency results above, 2004 was the least efficient because there was an increase in the number of staff, yet the distribution amount saw a decrease. Allocative efficiency results showed 100% efficiency in 2009 right after its worst score of 78.581% in 2008. The most inefficient result in 2008 is due to the high increase in collection amount (input) against the increase of distribution (output). The same is true for distribution cost efficiency, although maximum efficiency was achieved also in 2010.

### **Overall Efficiencies**

Overall technical efficiency seems to follow the collection technical efficiency pattern where total efficiency was achieved in 2010 and 2011. The minimum technical efficiency score also follows suit i.e. in 2004. This indicates that the number of amils has a significant high influence on the efficiency scores. Allocative and cost efficiency scores show maximum efficiency every year under review. However, when running the overall efficiency test, both the collection and the distribution amount were considered outputs. This indicates that allocative efficiency i.e. LZS is utilizing its input proportionately to ensure minimum cost incurred to produce a given output (amount collected and amount distributed) at a given input prices (cost of collection and cost of distribution).

**Table 6:** DEA Results for LZS Overall Efficiencies

| <i>Overall Efficiency</i> |                  |                   |             |
|---------------------------|------------------|-------------------|-------------|
| <b>Year</b>               | <b>Technical</b> | <b>Allocative</b> | <b>Cost</b> |
| 2001                      | 0.69153          | 1.00000           | 1.00000     |
| 2002                      | 0.70393          | 1.00000           | 1.00000     |
| 2003                      | 0.70103          | 1.00000           | 1.00000     |
| 2004                      | 0.64255          | 1.00000           | 1.00000     |
| 2005                      | 0.68067          | 1.00000           | 1.00000     |
| 2006                      | 0.76990          | 1.00000           | 1.00000     |
| 2007                      | 0.76823          | 1.00000           | 1.00000     |
| 2008                      | 0.90545          | 1.00000           | 1.00000     |
| 2009                      | 0.88637          | 1.00000           | 1.00000     |
| 2010                      | 1.00000          | 1.00000           | 1.00000     |
| 2011                      | 1.00000          | 1.00000           | 1.00000     |

**Target Efficient Input versus Actual Input**

The DEA Excel Solver also yielded the target efficient input so as to provide an indication of the amount of resources that are either over or underutilized.

*Collection Technical Efficiency Target Input*

**Appendix 2** shows the amount of resources that was underutilized with in the period prior to 2010 which is deemed to be the benchmark for technical efficiency. The number of Amils that were over the efficient requirements were the highest in 2004 where the required number was 119 yet the actual number employed by LZS was 185, resulting in an

“excess” of 66. In 2006, 2007 and 2008, the actual number of branches LZS had was 20, 20 and 22 respectively, giving an overcapacity of 11 branches in each of these years, when benchmarked against 2010. In 2005, LZS had 11 banks as collection agents. But, benchmarked against 2010, the efficient number of banks should be only 6.

#### *Collection Allocative Efficiency Target Input*

For allocative efficiency measure, 2007 was identified as the benchmark (Appendix 3). Prior to 2007, the amount “over-spent” on collection efforts ranged from RM350,000 in 2001 to RM1.33 million in 2006. However, the differences grew even bigger after 2007 with the amount overspent reaching RM3.08 million in 2011.

#### *Collection Cost Efficiency Target Input*

LZS was found to be fully efficient in 2007, 2009, 2010 and 2011. Benchmarked against these years, input of the number of Amils was deemed underutilized as high as 40 people in 2001 which showed a gradual decreasing trend until the excess was only for 4 people in 2008. The number of branches underutilized was highest in 2006 with 7 branches. In 2008 2.5 collection agent banks was deemed to excesses and the cost of collection (Amil portion) too high by a maximum of RM1.12 million in 2006 (Appendix 4).

#### *Distribution Technical Efficiency Target Input*

Distribution wise, LZS was 100% technically efficient in 2010. However, the results show (Appendix 5) that LZS was overstaffed in all the other years, with the maximum being 86 staff in underutilized in 2004 and the lowest in 2011 with 24.

#### *Distribution Allocative Efficiency Target Input*

Distribution allocative efficiency for LZS peaked in 2009 (Appendix 6). Compared to amount collected (as input) to the amount distributed, the highest “over collection” was in 2008, just a year before achieving 100% allocative efficiency, with RM52.36 million of underutilized portion.

The same pattern emerges for distribution expenses. LZS was most efficient also in 2009, while its most inefficient year was in 2008 when it is deemed to have overspent by RM1.57 million on efforts of distribution of Zakat.

#### *Distribution Cost Efficiency Target Input*

LZS was found to be cost efficient in 2009 and 2010 (Appendix 7). In fact, as depicted by chart 2 above, allocative and cost efficiency move in tandem with each other. This is due to the influence of collection amount and distribution expenses in both allocative and cost efficiency while there is only no of staff in technical efficiency measure.

#### *Overall Technical Efficiency Target Input*

Overall technical efficiency was 100% in 2010 and 2011. Least efficient years were 2004 for number of Amils, 2004 to 2006 for number of branches and 2005 for number of agent banks (Appendix 8).

#### *Overall Allocative Efficiency Target Input*

Allocative efficiency was 100% in throughout the period under review (Appendix 9). Even so, collection expenses do show underutilization, though very minimal. Collection expenses do reach full efficiency in 2007 and 2009.

#### *Overall Cost Efficiency Target Input*

Although, overall cost efficiency was found to be fully efficient, this is due mainly to the efficient utilization of collection expenses and distribution expenses (Appendix 10). Other resources still showed underutilizations except in the year 2007, 2009, 2010 and 2011.

#### ***Overall Efficiency***

Finally, both the inputs of the first stage and the second stage were grouped and compared them against both outputs of amount collected and amount distributed using the same DEA software and the result actually confirms the findings of stage one and stage two. While allocative and cost efficiencies are 100% for all the years under review,

the technical efficiency only achieve 100% in 2010 and 2011. However, when testing for overall efficiency, the 100% results of the allocative and cost efficiencies maybe misleading. As shown in appendix 8 and 9 that there are inputs which are underutilized but are overshadowed by the efficiencies of other inputs. Thus, testing for efficiency using the two stage method, allows for a higher scrutiny of the relevant inputs, compared to a single stage method.

### **Conclusion**

The measurement of efficiencies is not by any means a deliberate effort to find irregularities or misappropriation of funds in a zakat institution. What these scores provide is only an indication that the DMU (in this case LZS) can do better than it already has. Although, the inaccessibility of information may make this study not totally conclusive, the separation of the collection and distribution function in a linked two stage analysis has given a better perception of efficiencies between these two functions. It lets us observe clearly, where LZS excels and where they lag.

In summary, in both collection and distribution, LZS has lagging resources, especially in technical efficiency. The public perception that there are inefficiencies in distribution is pronounced here in this study as the DEA results shows a lower efficiency mean in distribution than in collection function. Using these DEA results, LZS can use the benchmarked years as a guide to gauge the efficiencies of the resources e.g. on the efforts by their branches, the amils and the collection agents. Of course, should this study being given access to more details of the amil portion, on how much was specifically spent for the activity of collection (e.g. in giving talks and seminars to create awareness of zakat and LZS's collection outlets) and distribution (e.g. amount spent in seeking out the needy), the allocative and cost efficiency scores would have been more accurate and meaningful to LZS in gauging their performances.

In light of the above, it is strongly recommend that LZS and all zakat governing bodies, particularly in Malaysia and countries where the payment of zakat is not compulsory, to practice transparency in their operations. Their reservation in imparting certain information may only bring more negative perceptions in the public eyes. Although, zakat

contributors have no claims on the zakat that they have given, they, as Muslims who had given zakat out of faith, have the right to know how efficiently their contributions are utilized. The establishment of a central governing body to oversee the governance of zakat institution is also recommended. One such body, JAWHAR (Department of Wakaf, Zakat and Haj), established by the federal government is a positive move, and it is hoped that it will play a proactive role in the proper management of zakat distribution in this country. Finally, we also recommend this technique to all non-profit organizations, to gauge their performance in raising the funds and subsequently, using it in their policy making and strategic decisions, in reaching their intended goals.

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## Appendices

**Appendix 1A: Stage 1 Variables**

|      | Input       |          |              |                                       | Output                     |
|------|-------------|----------|--------------|---------------------------------------|----------------------------|
|      | No of Amils | Branches | Agent banks* | Collection Expenses**<br>(RM Million) | Collection<br>(RM Million) |
| 2001 | 175         | 18       | 7            | 15.24                                 | 126.99                     |
| 2002 | 176         | 18       | 8            | 16.56                                 | 137.98                     |
| 2003 | 183         | 19       | 8            | 17.04                                 | 141.97                     |
| 2004 | 185         | 20       | 10           | 16.18                                 | 134.86                     |
| 2005 | 180         | 20       | 11           | 16.68                                 | 139.00                     |
| 2006 | 183         | 22       | 11           | 20.06                                 | 159.84                     |
| 2007 | 232         | 22       | 13           | 23.70                                 | 202.19                     |
| 2008 | 238         | 22       | 14           | 30.40                                 | 244.47                     |
| 2009 | 287         | 22       | 14           | 34.00                                 | 283.79                     |
| 2010 | 297         | 23       | 15           | 42.12                                 | 336.93                     |
| 2011 | 358         | 24       | 15           | 49.20                                 | 393.50                     |

\* Agent Banks - Banks which act as collection agents for Lembaga Zakat Selangor

\*\* Collection Expenses - Comprising expenses for administration, R & D, marketing and promotion, human resource, infrastructure and commission for collection agents

**Appendix 1B: Stage 2 Variables**

|      | <b>Input</b>                       |                                                |                    | <b>Output</b>                        |
|------|------------------------------------|------------------------------------------------|--------------------|--------------------------------------|
|      | <b>Collection<br/>(RM million)</b> | <b>Distribution Expenses*<br/>(RM million)</b> | <b>No of Staff</b> | <b>Distribution<br/>(RM million)</b> |
| 2001 | 126.99                             | 3.81                                           | 175                | 107.94                               |
| 2002 | 137.98                             | 4.14                                           | 176                | 119.70                               |
| 2003 | 141.97                             | 4.26                                           | 183                | 113.57                               |
| 2004 | 134.86                             | 4.05                                           | 185                | 110.58                               |
| 2005 | 139.00                             | 4.17                                           | 180                | 118.15                               |
| 2006 | 159.84                             | 4.80                                           | 183                | 135.65                               |
| 2007 | 202.19                             | 6.07                                           | 232                | 174.52                               |
| 2008 | 244.47                             | 7.33                                           | 238                | 189.00                               |
| 2009 | 283.79                             | 8.51                                           | 287                | 279.19                               |
| 2010 | 336.93                             | 10.11                                          | 297                | 330.36                               |
| 2011 | 393.50                             | 11.81                                          | 358                | 371.70                               |

\* Comprising expenses incurred during distribution including costs for organizing zakat giving ceremonies.

**APPENDIX 2: Collection Resources Analysis: Technical Efficiency**

|      | Efficient Input Target |          |             | Actual Input |          |             | Over/(Under) Utilized |          |             |
|------|------------------------|----------|-------------|--------------|----------|-------------|-----------------------|----------|-------------|
| Year | No of Amils            | Branches | Agent banks | No of Amils  | Branches | Agent banks | No of Amils           | Branches | Agent banks |
| 2001 | 116                    | 8        | 5           | 175          | 18       | 7           | (59)                  | (10)     | (2)         |
| 2002 | 124                    | 9        | 6           | 176          | 18       | 8           | (52)                  | (9)      | (2)         |
| 2003 | 128                    | 9        | 6           | 183          | 19       | 8           | (55)                  | (10)     | (2)         |
| 2004 | 119                    | 9        | 6           | 185          | 20       | 10          | (66)                  | (11)     | (4)         |
| 2005 | 123                    | 9        | 6           | 180          | 20       | 11          | (57)                  | (11)     | (5)         |
| 2006 | 141                    | 11       | 7           | 183          | 22       | 11          | (42)                  | (11)     | (4)         |
| 2007 | 178                    | 14       | 9           | 232          | 22       | 13          | (54)                  | (8)      | (4)         |
| 2008 | 215                    | 17       | 11          | 238          | 22       | 14          | (23)                  | (5)      | (3)         |
| 2009 | 252                    | 19       | 12          | 287          | 22       | 14          | (35)                  | (3)      | (2)         |
| 2010 | 297                    | 23       | 15          | 297          | 23       | 15          | -                     | -        | -           |
| 2011 | 358                    | 24       | 15          | 358          | 24       | 15          | -                     | -        | -           |

**APPENDIX 3: Collection Resources Analysis: Allocative Efficiency**

|      | Efficient Input Target | Actual Input | Over/(Under) Utilization |
|------|------------------------|--------------|--------------------------|
| Year | Amil Portion           | Amil Portion | Amil Portion             |
| 2001 | 14.88                  | 15.24        | (0.35)                   |
| 2002 | 16.17                  | 16.56        | (0.38)                   |
| 2003 | 16.64                  | 17.04        | (0.40)                   |
| 2004 | 15.81                  | 16.18        | (0.38)                   |
| 2005 | 16.29                  | 16.68        | (0.39)                   |
| 2006 | 18.74                  | 20.06        | (1.33)                   |
| 2007 | 23.70                  | 23.70        | -                        |
| 2008 | 28.66                  | 30.40        | (1.74)                   |
| 2009 | 33.26                  | 34.00        | (0.74)                   |
| 2010 | 39.49                  | 42.12        | (2.62)                   |
| 2011 | 46.12                  | 49.20        | (3.08)                   |

**APPENDIX 4: Collection Resources Analysis: Cost Efficiency**

|      | Efficient Input Target |          |             |              |             | Actual Input |             |              |             |          | Over/(Under) Utilization |              |             |          |             |
|------|------------------------|----------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|----------|--------------------------|--------------|-------------|----------|-------------|
| YEAR | No of Amils            | Branches | Agent banks | Amil Portion | No of Amils | Branches     | Agent banks | Amil Portion | No of Amils | Branches | Agent banks              | Amil Portion | No of Amils | Branches | Agent banks |
| 2001 | 135                    | 11       | 7           | 15.10        | 175         | 18           | 7           | 15.24        | (40)        | (7)      | (0)                      | (0.14)       | (40)        | (7)      | (0)         |
| 2002 | 149                    | 13       | 8           | 16.34        | 176         | 18           | 8           | 16.56        | (27)        | (5)      | (0)                      | (0.22)       | (27)        | (5)      | (0)         |
| 2003 | 152                    | 13       | 8           | 16.85        | 183         | 19           | 8           | 17.04        | (31)        | (6)      | (0)                      | (0.18)       | (31)        | (6)      | (0)         |
| 2004 | 155                    | 15       | 9           | 15.81        | 185         | 20           | 10          | 16.18        | (30)        | (5)      | (1)                      | (0.38)       | (30)        | (5)      | (1)         |
| 2005 | 159                    | 15       | 9           | 16.29        | 180         | 20           | 11          | 16.68        | (21)        | (5)      | (2)                      | (0.39)       | (21)        | (5)      | (2)         |
| 2006 | 173                    | 15       | 9           | 18.94        | 183         | 22           | 11          | 20.06        | (10)        | (7)      | (2)                      | (1.12)       | (10)        | (7)      | (2)         |
| 2007 | 232                    | 22       | 13          | 23.70        | 232         | 22           | 13          | 23.70        | -           | -        | -                        | -            | -           | -        | -           |
| 2008 | 234                    | 18       | 12          | 29.84        | 238         | 22           | 14          | 30.40        | (4)         | (4)      | (2)                      | (0.56)       | (4)         | (4)      | (2)         |
| 2009 | 287                    | 22       | 14          | 34.00        | 287         | 22           | 14          | 34.00        | -           | -        | -                        | -            | -           | -        | -           |
| 2010 | 297                    | 23       | 15          | 42.12        | 297         | 23           | 15          | 42.12        | -           | -        | -                        | -            | -           | -        | -           |
| 2011 | 358                    | 24       | 15          | 49.20        | 358         | 24           | 15          | 49.20        | -           | -        | -                        | -            | -           | -        | -           |

**APPENDIX 5: Distribution Resources Analysis: Technical Efficiency**

|      | Efficient Input Target | Actual Input | Over/(Under) Utilization |
|------|------------------------|--------------|--------------------------|
| Year | No of Staff            | No of Staff  | No of Staff              |
| 2001 | 97                     | 175          | (78)                     |
| 2002 | 108                    | 176          | (68)                     |
| 2003 | 102                    | 183          | (81)                     |
| 2004 | 99                     | 185          | (86)                     |
| 2005 | 106                    | 180          | (74)                     |
| 2006 | 122                    | 183          | (61)                     |
| 2007 | 157                    | 232          | (75)                     |
| 2008 | 170                    | 238          | (68)                     |
| 2009 | 251                    | 287          | (36)                     |
| 2010 | 297                    | 297          | -                        |
| 2011 | 334                    | 358          | (24)                     |

**APPENDIX 6: Distribution Resources Analysis: Allocative Efficiency**

|      | Efficient Input Target |                       | Actual Input |                       | Over/(Under) Utilization |                       |
|------|------------------------|-----------------------|--------------|-----------------------|--------------------------|-----------------------|
| Year | Collection             | Distribution Expenses | Collection   | Distribution Expenses | Collection               | Distribution Expenses |
| 2001 | 109.72                 | 3.29                  | 126.99       | 3.81                  | (17.27)                  | (0.52)                |
| 2002 | 121.67                 | 3.65                  | 137.98       | 4.14                  | (16.31)                  | (0.49)                |
| 2003 | 115.44                 | 3.46                  | 141.97       | 4.26                  | (26.52)                  | (0.80)                |
| 2004 | 112.40                 | 3.37                  | 134.86       | 4.05                  | (22.45)                  | (0.67)                |
| 2005 | 120.09                 | 3.60                  | 139.00       | 4.17                  | (18.90)                  | (0.57)                |
| 2006 | 137.89                 | 4.14                  | 159.84       | 4.80                  | (21.95)                  | (0.66)                |
| 2007 | 177.39                 | 5.32                  | 202.19       | 6.07                  | (24.80)                  | (0.74)                |
| 2008 | 192.11                 | 5.76                  | 244.47       | 7.33                  | (52.36)                  | (1.57)                |
| 2009 | 283.79                 | 8.51                  | 283.79       | 8.51                  | -                        | -                     |
| 2010 | 335.80                 | 10.07                 | 336.93       | 10.11                 | (1.13)                   | (0.03)                |
| 2011 | 377.82                 | 11.33                 | 393.50       | 11.81                 | (15.68)                  | (0.47)                |

**APPENDIX 7: Distribution Resources Analysis: Cost Efficiency**

|      | Efficient Input Target |                      |             |  | Actual Input |                      |             | Over/(Under) Utilization |                      |             |
|------|------------------------|----------------------|-------------|--|--------------|----------------------|-------------|--------------------------|----------------------|-------------|
| Year | Collection             | Cost of Distribution | No of Staff |  | Collection   | Cost of Distribution | No of Staff | Collection               | Cost of Distribution | No of Staff |
| 2001 | 109.72                 | 3.29                 | 111         |  | 126.99       | 3.81                 | 175         | (17.27)                  | (0.52)               | (64)        |
| 2002 | 121.67                 | 3.65                 | 123         |  | 137.98       | 4.14                 | 176         | (16.31)                  | (0.49)               | (53)        |
| 2003 | 115.44                 | 3.46                 | 117         |  | 141.97       | 4.26                 | 183         | (26.52)                  | (0.80)               | (66)        |
| 2004 | 112.40                 | 3.37                 | 114         |  | 134.86       | 4.05                 | 185         | (22.45)                  | (0.67)               | (71)        |
| 2005 | 120.09                 | 3.60                 | 121         |  | 139.00       | 4.17                 | 180         | (18.90)                  | (0.57)               | (59)        |
| 2006 | 137.89                 | 4.14                 | 139         |  | 159.84       | 4.80                 | 183         | (21.95)                  | (0.66)               | (44)        |
| 2007 | 177.39                 | 5.32                 | 179         |  | 202.19       | 6.07                 | 232         | (24.80)                  | (0.74)               | (53)        |
| 2008 | 192.30                 | 5.77                 | 187         |  | 244.47       | 7.33                 | 238         | (52.17)                  | (1.57)               | (51)        |
| 2009 | 283.79                 | 8.51                 | 287         |  | 283.79       | 8.51                 | 287         | -                        | -                    | (0)         |
| 2010 | 336.93                 | 10.11                | 297         |  | 336.93       | 10.11                | 297         | -                        | -                    | -           |
| 2011 | 378.81                 | 11.36                | 345         |  | 393.50       | 11.81                | 358         | (14.69)                  | (0.44)               | (13)        |

**APPENDIX 8: Overall Resources Analysis: Technical Efficiency**

| Year | Efficient Input Target |          |             | Actual Input |          |             | Over/(Under) Utilization |          |             |
|------|------------------------|----------|-------------|--------------|----------|-------------|--------------------------|----------|-------------|
|      | No of Amils            | Branches | Agent banks | No of Amils  | Branches | Agent banks | No of Amils              | Branches | Agent banks |
| 2001 | 116                    | 8        | 5           | 175          | 18       | 7           | (59)                     | (10)     | (2)         |
| 2002 | 124                    | 9        | 6           | 176          | 18       | 8           | (52)                     | (9)      | (2)         |
| 2003 | 128                    | 9        | 6           | 183          | 19       | 8           | (55)                     | (10)     | (2)         |
| 2004 | 119                    | 9        | 6           | 185          | 20       | 10          | (66)                     | (11)     | (4)         |
| 2005 | 123                    | 9        | 6           | 180          | 20       | 11          | (57)                     | (11)     | (5)         |
| 2006 | 141                    | 11       | 7           | 183          | 22       | 11          | (42)                     | (11)     | (4)         |
| 2007 | 178                    | 14       | 9           | 232          | 22       | 13          | (54)                     | (8)      | (4)         |
| 2008 | 215                    | 17       | 11          | 238          | 22       | 14          | (23)                     | (5)      | (3)         |
| 2009 | 254                    | 19       | 12          | 287          | 22       | 14          | (33)                     | (3)      | (2)         |
| 2010 | 297                    | 23       | 15          | 297          | 23       | 15          | -                        | -        | -           |
| 2011 | 358                    | 24       | 15          | 358          | 24       | 15          | -                        | -        | -           |

## APPENDIX 9: Overall Resources Analysis: Allocative Efficiency

|      | Efficient Input Target |                       | Actual Input        |                       | Over/(Under) Utilization |                       |
|------|------------------------|-----------------------|---------------------|-----------------------|--------------------------|-----------------------|
| Year | Collection Expenses    | Distribution Expenses | Collection Expenses | Distribution Expenses | Collection Expenses      | Distribution Expenses |
| 2001 | 15.21                  | 3.81                  | 15.24               | 3.81                  | (0.02)                   | -                     |
| 2002 | 16.53                  | 4.14                  | 16.56               | 4.14                  | (0.03)                   | -                     |
| 2003 | 17.01                  | 4.26                  | 17.04               | 4.26                  | (0.03)                   | -                     |
| 2004 | 16.16                  | 4.05                  | 16.18               | 4.05                  | (0.03)                   | -                     |
| 2005 | 16.65                  | 4.17                  | 16.68               | 4.17                  | (0.03)                   | -                     |
| 2006 | 19.15                  | 4.80                  | 20.06               | 4.80                  | (0.91)                   | -                     |
| 2007 | 23.70                  | 6.07                  | 23.70               | 6.07                  | -                        | -                     |
| 2008 | 29.29                  | 7.33                  | 30.40               | 7.33                  | (1.11)                   | -                     |
| 2009 | 34.00                  | 8.51                  | 34.00               | 8.51                  | -                        | -                     |
| 2010 | 40.37                  | 10.11                 | 42.12               | 10.11                 | (1.75)                   | -                     |
| 2011 | 47.14                  | 11.81                 | 49.20               | 11.81                 | (2.06)                   | -                     |

**APPENDIX 10: Overall Resources Analysis: Cost Efficiency**

|      |             |          |             | Efficient Input Target |               |             |          |             | Actual Input |               |             |          |             | Over/(Under) Utilization |           |  |  |
|------|-------------|----------|-------------|------------------------|---------------|-------------|----------|-------------|--------------|---------------|-------------|----------|-------------|--------------------------|-----------|--|--|
| Year | No of Amils | Branches | Agent banks | Collectn Exp           | Distribtn Exp | No of Amils | Branches | Agent banks | Collectn Exp | Distribtn Exp | No of Amils | Branches | Agent banks | Collectn Exp             | Distn Exp |  |  |
| 2001 | 128         | 10       | 6           | 15.24                  | 3.81          | 175         | 18       | 7           | 15.24        | 3.81          | (47)        | (8)      | (1)         | -                        | -         |  |  |
| 2002 | 139         | 11       | 7           | 16.56                  | 4.14          | 176         | 18       | 8           | 16.56        | 4.14          | (37)        | (7)      | (1)         | -                        | -         |  |  |
| 2003 | 143         | 11       | 7           | 17.04                  | 4.26          | 183         | 19       | 8           | 17.04        | 4.26          | (40)        | (8)      | (1)         | -                        | -         |  |  |
| 2004 | 136         | 10       | 7           | 16.18                  | 4.05          | 185         | 20       | 10          | 16.18        | 4.05          | (49)        | (10)     | (3)         | -                        | -         |  |  |
| 2005 | 140         | 11       | 7           | 16.68                  | 4.17          | 180         | 20       | 11          | 16.68        | 4.17          | (40)        | (9)      | (4)         | -                        | -         |  |  |
| 2006 | 141         | 11       | 7           | 19.98                  | 4.80          | 183         | 22       | 11          | 20.06        | 4.80          | (42)        | (11)     | (4)         | (0.08)                   | -         |  |  |
| 2007 | 232         | 22       | 13          | 23.70                  | 6.07          | 232         | 22       | 13          | 23.70        | 6.07          | -           | -        | -           | -                        | -         |  |  |
| 2008 | 220         | 17       | 11          | 30.40                  | 7.33          | 238         | 22       | 14          | 30.40        | 7.33          | (18)        | (5)      | (3)         | -                        | -         |  |  |
| 2009 | 287         | 22       | 14          | 34.00                  | 8.51          | 287         | 22       | 14          | 34.00        | 8.51          | -           | -        | -           | -                        | -         |  |  |
| 2010 | 297         | 23       | 15          | 42.12                  | 10.11         | 297         | 23       | 15          | 42.12        | 10.11         | -           | -        | -           | -                        | -         |  |  |
| 2011 | 358         | 24       | 15          | 49.20                  | 11.81         | 358         | 24       | 15          | 49.20        | 11.81         | -           | -        | -           | -                        | -         |  |  |



## **The Causality between Financial Development and Economic Growth: The Case of Turkey**

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In this study, we investigate the causal relationship between financial development and economic growth in Turkey for the 1987:1-2012:4 period. We use eight series to indicate financial development and employ Johansen's (1991) Cointegration Approach, Pesaran's (2001) Bounds Testing and Granger Causality Tests. The test results suggest that long-run relationships exist between economic growth and all financial development indicators. Moreover, our findings support both supply leading and demand following hypotheses. The direction of the short-run and long-run causal relationship between economic growth and financial development depends on which financial development indicator is used. Particularly, improvements in financial development indicators related to the resource allocation function of the financial system lead to economic growth whereas economic growth causes financial development through increasing banks' assets in the long run.

### **1. Introduction**

The relationship between financial development and economic growth has been one of the most investigated subjects in economic literature for a long time. According to Schumpeter (1911), who was one of the first economists to discuss the effects of financial system on economic growth, banks enable resources to be allocated to innovative and productive fields by providing credits to firms. Thus, banks play an important role in economic development by enabling technological innovations. This view, which is based on Schumpeter (1911), is called as "supply leading hypothesis" by Patrick (1966).

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In economic literature, another view, which has been led by Robinson (1952), argues a causal relationship from economic growth to financial development. According to this view, as the economy grows, demand for financial institutions and tools will increase, and therefore economic growth will cause development of the financial system. This view is termed “demand following hypothesis” by Patrick (1966), which proposes a causal relationship from economic growth to financial development.

Until the beginning of 1990s, “Financial Repression School” suggested explanations to the effects of financial development on economic growth. According to McKinnon (1973) and Shaw (1973), the pioneers of Financial Repression School, policy implementations such as interest rate ceilings and keeping required reserve ratio at high levels restrain financial development and hence the economic growth. However, opposite implementations that liberalize financial system are expected to result in higher level of savings and productive investments, which increase the ratio of economic growth.

In the beginning of 1990s, the causal relationship from financial development to economic growth is started to be explained in the literature of the endogenous growth models. According to the endogenous growth models, the services provided by financial markets and instruments are assumed as endogenous variables. Financial development leads to economic growth through two channels. First, financial system provides funds for investments through mobilizing of savings, which leads to capital accumulation. Second, financial system monitors the investment projects, which help the spillover of information possessed by economic units and enhance total factor productivity. Capital accumulations and enhancing total factor productivity cause economic growth (Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; King and Levine, 1993b; Pagano, 1993; Greenwood and Smith, 1997).

In the related literature, it has been put forward that the causal relationship between financial development and economic growth can change its direction throughout the development process. According to this view argued by Patrick (1966), supply leading hypothesis is valid for the earlier stages of a country’s development, while demand following hypothesis is valid for the latter stages. In earlier stages of

development, services provided by the financial system accelerate technological development and the rate of economic growth increases. As development proceeds, economic growth increases demand for financial instruments and lead to development of financial system.

In the literature, besides the studies that support supply leading and demand following hypotheses, there are also those which support that there is no causal relationship between financial development and economic growth. For example, Lucas (1988) argues that monetary changes do not have any effect on economic growth, and therefore there is no causal relationship between financial development and economic growth.

The purpose of our study is to investigate the existence and the direction of the long run and short run causal relationships between financial development and economic growth in the 1987:1-2012:4 period in Turkish economy. Our study aims to contribute to the literature, in which there are many different views, with new evidence.

The selection of the variables indicating the level of financial development in an economy is one of the major problems encountered in the applied studies investigating the relationship between financial development and economic growth (Levine. 1997). Since there might be many financial events that are not recorded in economies, the variables that are used to proxy the level of financial development may be insufficient. This problem is encountered more frequently in countries with a weak financial infrastructure such as Turkey. This problem is tried to be solved in the applied literature by using many different variables as indicators of financial development. However, using many different financial development indicators in one model also arise econometric problems such as serial correlations. In our study, in order to circumvent aforementioned problems encountered in applied literature, eight different series are used to indicate financial developments and for every financial development indicator we form separate models.

In this study, we apply Johansen (1991) Cointegration and Peseran (2001) Bound Testing approaches in order to analyze the existence of the long run relationship between financial development and economic growth. The error correction models with the variables that are found to be cointegrated are tested for causal relationships by using Granger

Causality Test. Our findings suggest that the directions of the short-run and long-run causal relationships between economic growth and financial development indicators depend on the financial development indicators that are used. Thus, our findings support both supply leading and demand following hypotheses.

The paper consists of 6 sections including introduction and is organized as follows. The second section reviews the applied literature. In the third section, important developments in the near history of Turkish financial system are mentioned. The fourth section sets out the data set and econometric methodology. The empirical results are presented in the fifth section. The conclusion section offers the evaluation of the results.

## **2. Literature Review**

The theoretical approaches mentioned above which explain the relationship between financial development and economic growth predict four different types of causality relationships. The direction of the causal relationship between financial development and economic growth may be from financial development to economic growth or from economic growth to financial development. The former of these relationships puts forward the validity of the supply leading hypothesis, while the latter validates the demand following hypothesis. In addition to these, while there may exist a bidirectional causal relationship between financial development and economic growth, it is also possible to have no causal relationships between them. Many applied studies have provided evidences with regards to the direction of the causal relationship. Some of these studies are summarized in Table 1.

It can be seen from the Table 1 that cross sections were used in many of the applied studies until 2000s because of the insufficiency of length of time series (Demetriades and Hussein, 1996). The studies shown by the Table 1 reach the conclusion that there is a positive relationship between financial development and economic growth, but there is no consensus on the direction of the relationship. While Jung (1986), Kar and Pentecost (2000) and Kandır et.al. (2007) supported the demand following hypothesis, the results of Goldsmith (1969), Gupta (1984), Rousseau and Watchel (1998), Neusser and Kugler (1998), Xu (2000) and Arestis et.al. (2001), Aslan and Küçükaksoy (2006), Acaravcı et.al. (2007) and İnce (2011) are consistent with the supply leading

hyphothesis. Luintel and Kahn (1999), Ünalmış (2002) and Demirhan et.al. (2011) provided evidences for bidirectional causal relationships between financial development and economic growth.

**Table 1:** The Relationship between Financial Development and Economic Growth, Applied Literature

| Study                          | Period                                                         | Countries               | Financial Development Indicators                                                                                                                                                                                                                               | Method                                                                  | Result                                                                                                                                                     |
|--------------------------------|----------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Goldsmith (1969)               | 1949-1963<br>(annual data)                                     | 35 countries            | The Ratio of The Value of Financial Assets to GNP                                                                                                                                                                                                              | Graphical Analysis                                                      | A positive relationship is found where the ratio of size of financial instruments to the total production increases as the level of development increases. |
| Gupta (1984)                   | 1961-1980<br>(quarterly data)                                  | 14 developing countries | M2                                                                                                                                                                                                                                                             | VAR and Granger Causality Tests                                         | Supply leading hypothesis                                                                                                                                  |
| Jung (1986)                    | For at least 15 years depending on the countries (annual data) | 56 countries            | 1-M1/GDP<br>2-M2/GDP                                                                                                                                                                                                                                           | VAR and Granger Causality Tests                                         | In less developed countries, the causal relationship is from finance to economic growth. In developed countries, the causality is reversed.                |
| King and Levine (1993a)        | 1960-1989<br>(annual data)                                     | 80 countries            | 1 - M3/GDP<br>2 – The Ratio of the Total Assets of the Banking Sector to the Total Assets of Central Bank and Banking Sector<br>3 – Ratio of the Private Sector Credit to the Total Domestic Credit<br>4 – Ratio of the Volume of Private Sector Credit to GDP | OLS                                                                     | A positive relation between financial development and economic growth is found.                                                                            |
| Demetriades and Hussein (1996) | For at least 27 years depending on the countries (annual data) | 16 developing countries | 1-The Ratio of Total Deposits to GDP<br>2- Ratio of the Volume of Private Sector Credit to GDP                                                                                                                                                                 | VAR, VECM, Johansen Cointegration Technique and Granger Causality Tests | The direction of the causal relationship between financial development and economic growth could not be clearly determined.                                |
| Neusser and Kugler (1998)      | 1970-1991<br>(annual data)                                     | 13 OECD countries       | Financial sector's GDP                                                                                                                                                                                                                                         | VAR, Johansen Cointegration Technique and Granger Causality Tests       | GDPs of financial sector and manufacturing sector are cointegrated in half of the countries that are examined. (Supply Leading Hypothesis)                 |

**Table 1 (Continued): The Relationship between Financial Development and Economic Growth, Applied Literature**

| Study                                   | Period                                                         | Countries               | Financial Development Indicators                                                                                                                                                                                                                                                 | Method                                                                  | Result                                                                                                         |
|-----------------------------------------|----------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Levine and Zervos (1998)                | 1976-1993<br>(annual data)                                     | 47 countries            | 1-Capitalization of stock market<br>2-Turnover ratio of stock market<br>3-Value traded in the stock market divided by GDP<br>4-Volatility of stock returns<br>5-Bank credit to private sector divided by GDP                                                                     | OLS                                                                     | A strong positive relationship is found between financial development and economic growth.                     |
| Rousseau and Watchel (1998)             | 1870-1929<br>(annual data)                                     | 5 developed countries   | 1-Assets of commercial banks<br>2-The combined assets of commercial banks and saving institutions<br>3-Assets of commercial banks, savings institutions, insurance companies, credit cooperatives, and pension funds<br>4-The difference between the stock of money and the base | VAR, VECM, Johansen Cointegration Technique and Granger Causality Tests | Supply Leading Hypothesis                                                                                      |
| Luintel and Kahn (1999)                 | For at least 36 years depending on the countries (annual data) | 10 developing countries | The Ratio of Total Deposits to GDP                                                                                                                                                                                                                                               | VAR, VECM, Johansen Cointegration Technique and Granger Causality Tests | Bidirectional causal relationship is found between financial development and economic growth in all countries. |
| Xu (2000)                               | 1960-1993<br>(annual data)                                     | 41 countries            | The Ratio of Total Deposits to GDP                                                                                                                                                                                                                                               | VAR and Impulse-Response Analysis                                       | Supply Leading Hypothesis                                                                                      |
| Arestis, Demetriades and Luintel (2001) | 1972-1998<br>(quarterly data)                                  | 5 developed countries   | 1-The ratio of stock market value to GDP<br>2-The ratio of domestic bank credit to GDP<br>3-Stock market volatility                                                                                                                                                              | VECM, Johansen Cointegration Technique and weak exogeneity test         | Developments both in banking and stock exchange market affect economic growth positively.                      |

**Table 2:** The Relationship between Financial Development and Economic Growth, In Case of Turkey

| Study                       | Period                        | Financial Development Indicators                                                                                                                                                                                                               | Result                                                                                                                                                                                                 |
|-----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kar and Pentecost (2000)    | 1963-1995<br>(annual data)    | 1-M2/GDP<br>2-The Ratio of Total Deposits to GDP<br>3-The Ratio of Credits to GDP<br>4- Ratio of the Private Sector Credit to GDP<br>5- Ratio of the Private Sector Credit to the Total Credit                                                 | The direction of the causal relationship between financial development and economic growth depends on the indicators. However, overall tendency is from economic growth towards financial development. |
| Ünalımsı (2002)             | 1970-2001<br>(annual data)    | 1-M2/GDP<br>2- The Ratio of Total Deposits to GDP<br>3- The Ratio of Credits to GDP<br>4- Ratio of the Private Sector Credit to GDP<br>5- Ratio of the Private Sector Credit to the Total Credit                                               | In the short run, the direction of the causal relationship is from financial development towards economic growth. In the long run, causal relationship is bidirectional.                               |
| Aslan and Kütükaksoy (2006) | 1970-2004<br>(annual data)    | The volume of private sector credits                                                                                                                                                                                                           | Supply Leading Hypothesis                                                                                                                                                                              |
| Aslan and Korap (2006)      | 1987-2004<br>(quarterly data) | 1-M2Y/GDP<br>2- Ratio of the Volume of Private Sector Credit to GDP                                                                                                                                                                            | A long run relationship exists between financial development and economic growth. The direction of the causal relationship depends on the indicators of financial development that are being used.     |
| Kandır et.al. (2007)        | 1988-2004<br>(quarterly data) | 1-The ratio of the transactions in stock market to the capitalization of stock market<br>2- Ratio of the Private Sector Credit to GDP<br>3- The transactions in stock market divided by GDP<br>4-Capitalization of stock market divided by GDP | Demand Following Hypothesis                                                                                                                                                                            |
| Acaravcı et.al. (2007)      | 1986-2006<br>(quarterly data) | The Ratio of Total Deposits to GDP                                                                                                                                                                                                             | Supply Leading Hypothesis in the short run                                                                                                                                                             |
| İnce (2011)                 | 1980-2010<br>(annual data)    | 1-M2/GDP<br>2- Ratio of the Total Credit to GDP<br>3- Ratio of the Private Sector Credit to GDP<br>4-Ratio of the Deposits to GDP<br>5- Capitalization of stock market                                                                         | Supply Leading Hypothesis in the short run                                                                                                                                                             |
| Demirhan et.al. (2011)      | 1987-2006<br>(quarterly data) | 1- Ratio of the Private Sector Credit to GDP<br>2- Capitalization of stock market divided by GDP                                                                                                                                               | Bidirectional causal relationship                                                                                                                                                                      |

The causal relationship between financial development and economic growth for Turkey is intensively investigated in 2000s. Table 2 summarizes some of these studies. Kar and Pentecost (2000) used five indicators of financial development for the 1963-1995 period and applied Granger Causality Tests. Their study revealed that the direction of the causal relationship between financial development and economic growth depends on the financial development indicator. According to the results of the study, financial development causes economic growth when the ratio of the money to the GDP indicates financial development, while economic growth causes financial development when the ratios of bank deposit, private credit and domestic credit to GDP are used as the indicators of financial development. Ünalınış (2002) used the same indicators of financial development as Kar and Pentescot's for the 1970-2001 period and applied Granger causality method. She found a causal relationship from financial development to economic growth in the short run and a bidirectional causal relationship for the long run. Aslan and Küçükaksoy (2006), using Granger causality test for the 1970-2004 period, concluded that financial development leads to economic growth. They utilized an increase in the volume of private sector credits as financial development indicator. Aslan and Korap (2006) applied Granger causality test and Johansen cointegration technique for the 1987-2004 period. According to their results, although a long run relationship is found between financial development and economic growth, the direction of the causal relationship depends on the indicators of financial development that is used. Kandır et. al. (2007) used four different indicators of financial development, three of which are related to stock exchange market and one related to the credit allocation of the banks. They applied Johansen cointegration technique and causality tests for the 1988-2004 period, and concluded that economic growth results in financial development. Acaravcı et. al. (2007) employed cointegration tests and VAR analysis on quarterly data from 1986-2006 period. In this study, using the increase in the ratio of total credit to GDP as financial development, they concluded that a long run relationship does not exist between financial development and economic growth. However, they also found that financial development causes economic growth in the short run. Using causality tests for the 1980-2010 period, İnce (2011) revealed that a long run relationship between financial development and economic growth does not exist, while financial development causes economic growth in the short run. For the 1987-2006 period, Demirhan et. al. (2011) applied error

correction model and impulse response analysis and found a bidirectional causal relationship between financial development and economic growth. Bank credits provided to the private sector and total value of the stock exchange market are used as indicators of financial development in the study, and the tests results show that the banking sector contributes more to the economic growth than the capital markets. It is observed that the studies for Turkey have different results so that more evidence is needed to reach a conclusion. Unlike the previous studies, our study uses a longer period and more variables to indicate financial development, which is the contribution of our study to the literature.

### **3. Recent Developments in Turkish Financial System**

There were radical changes in the structure of the financial system in Turkey in the 1980s. During the 1980s, financial development process was based on practices of financial liberalization. The primary practice of financial liberalization was liberalization of term deposit accounts and credit interest rates<sup>1</sup>. Required reserve ratios were gradually decreased from high rates such as 25% to 15% with decisions taken in 1985 and 1986. Banks foreign currency activities were liberalized with the Law no. 30 in 1984. This practice became the first step of the liberalization of the foreign exchange regime. As the second step of liberalization of the foreign exchange regime, Interbank Foreign Exchange and Effective Market were established within the Central Bank of Turkey in 1988. Foreign exchange regime was liberalized even more with the Law no. 32 in 1989. Controls on capital movement were lifted to a major extent with the same law.

In the post-1980 period, financial development gained new momentum with new financial markets joining to the financial system. After the new regulations that were made in Capital Markets' Law in 1982, Istanbul Stock Exchange (İMKB, henceforth ISE) has reopened in 1985. Interbank Money Market was established in 1986. Market for Gold in Exchange for Foreign Currency was established in 1989, under the authority of Central Bank of Turkey to import gold. In 1995, Istanbul

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1. After the economic crisis in 1994, Central Bank of Turkey interfered with the interest rates, however deregulated interest rates again in January 1995 (Yülek 1998).

Gold Exchange was opened, and the authority to import gold was transferred to market participants.

Since the 2000s, financial depth process in Turkey has speeded up with new financial institutions and instruments being incorporated into the financial system. In 2007, the bonds indexed to the Consumer Price Index started to be issued by Undersecretaries of Treasury. Mortgage and Private Pension System are other new financial tools that came into effect in this period.

First practice related to derivatives markets in Turkey was İstanbul Gold Exchange Derivatives Exchange, which was started as derivatives market in 1997. Another example of derivatives market, İstanbul Stock Exchange General Directorate of Futures, put TL/USD futures contracts into operation in 2001 and TL/EURO futures in 2003. İstanbul Gold Exchange Derivatives Exchange and ISE General Directorate of Futures were terminated operation of futures in 2005, and Turkey's first market for derivative transactions, Turkish Derivatives Exchange (VOB) was established. Traded value of VOB, which was 3 billion TL when it was established in 2005, reached 404 billion TL in 2012 (VOB, 2012).

It can be argued that the role of banks in economy has changed within the period of analysis. Since the first half of 1990s, the public deficit increased and public sector's demand for resources was met through Treasury's usage of short term credit from the Central Bank and Government Debt Securities that were supplied to the market. During this period, banks have become the primary financial components that financed the public deficit. Against this, first step that aimed to restructure the banking sector was the Banking Law dated June 18, 1999 and numbered 4389. It was set forth as a precondition by the International Monetary Fund (IMF), before the stabilization program started in 2000. Other important regulation made in the 2000s was the obligation to establish a committee on risk management and internal audit. In parallel to the decreasing inflation in 2000s, there was an increase in the amount of consumer credits and commercial credits that the banks have supplied. Especially as the result of the increase in commercial credits, banks' credit portfolio reached a size bigger than state bond portfolio. Along with this, the amount of increase in the banking credit portfolio, which reached a level of 35% in 2010, was assessed as the reason of the high current account deficit by the Central

Bank. As the result of precautions that were taken and the developments taking place in the world, the risk appetite decreased, and caused this rate to regress to level of %25 in 2011.

#### 4. Data and Econometric Methodology

##### 4.1. Data

In this study, we use quarterly data for the 1987-2012 period in Turkey. Data on Gross Domestic Product (GDP), which are used as the indicator of economic growth, are obtained from Turkish Statistical Institute, all of the data that are used as indicators of financial development are acquired from Central Bank of Turkey. Information on the variables used in the analysis is given in Table 3.

**Tablo 3:** Descriptions of Variables

|    | Variable | Descriptions                                                                                               |
|----|----------|------------------------------------------------------------------------------------------------------------|
| 1. | BAC      | The Ratio of the Total Assets of the Banking Sector to the Total Assets of Central Bank and Banking Sector |
| 2. | BAY      | Ratio of the Total Assets of the Banking Sector to GDP                                                     |
| 3. | CPD      | Ratio of the Private Sector Credits to the Total Domestic Credits                                          |
| 4. | CPY      | Ratio of the Volume of Private Sector Credits to GDP                                                       |
| 5. | DCY      | Ratio of the Volume of Total Domestic Credits to GDP                                                       |
| 6. | DEPY     | Ratio of the Total Banks' Deposits to GDP                                                                  |
| 7. | M2Y      | Ratio of M2Y to GDP                                                                                        |
| 8. | STY      | Ratio of Total Volume of İstanbul Stock Exchange (ISE) to GDP                                              |
| 9. | Y        | GDP with Fixed (1998) Prices (Thousand TL)                                                                 |

Eight series are used to indicate financial development. First indicators of financial development are the ratios of broad money supply (M2Y) and bank deposits to GDP (DEPY), which are frequently used to

measure the level of financial development in the literature. Another indicator of financial development is the ratio of the volume of total domestic credits to GDP (DCY), since domestic credits are the major component of the total assets of the financial sector. Considering that the credits provided to the private sector is more productive than those provided to the public sector, and in order to have a more direct criterion of the financial intermediation, the variable of ratio of the private sector credits to GDP (CPY) is used as an indicator of financial development. It is claimed that as the private sector's share in credits increases, banking sector allocates resources more efficiently (Kar and Pentecost 2000). For this reason, the ratio of the private sector credits to total domestic credits (CPD) is used as another indicator of financial development. Another indicator of financial development is the ratio of the total assets of the banking sector to the total of the assets of the central bank and the banking sector (BAC). According to King and Levine (1993 a,b), financial development is expected to accelerate while this ratio rises, since the banking sector is more successful in financial services than the central banks. Another indicator of financial development is the ratio of the total assets of the banking sector to GDP (BAY). Similar to the DEPY variable, in the literature an increase in the banking sector assets is used as an indicator of financial development. Eighth financial development indicator in the study is the ratio of the total volume of ISE to GDP, which measures the development of capital markets (STY).

The series used in the analysis are seasonally adjusted through Census X-12 method.

#### **4.2. Econometric Methodology**

Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables. To determine whether a group of non-stationary series are cointegrated or not, we use Johansen (1991) cointegration technique and Pesaren's (2001) Bounds Tests.

Johansen (1991) cointegration method depends on VAR model that contains the differences and levels of non-stationary series. VAR model with  $p$ -dimensions as a basis for Johansen Cointegration analysis is given in the equation below:

$$X_t = A_1 X_{t-1} + \dots + A_k X_{t-p} + \Phi D_t + \varepsilon_t, \quad t = 1, \dots, T \quad (1)$$

In equation number (1)  $X_0, \dots, X_{t-p}$  denote vectors of the variables of integrated of order one  $I(1)$ ;  $A_t$  denotes coefficient vectors;  $D_t$  denotes the vector of deterministic variables (linear trend, dummy variables, constant term) and  $\varepsilon_t$  denotes the error term called white noise which has a mean value of zero and constant variance. The equation number (1) can be expressed as follows after some algebraic operations:

$$\Delta X_t = \Pi X_{t-1} + \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-p+1} + \Phi D_t + \varepsilon_t, \quad t = 1, \dots, T \quad (2)$$

The  $\Pi$  and  $\Gamma$  terms in equation number (2) are presented below:

$$\Pi = \sum_{i=1}^p A_i - I_p \text{ ve } \Gamma_i = -\sum_{j=i+1}^p A_j \quad (3)$$

The rank of matrix of  $\Pi$  coefficient in equation number (2) is equal to the number of cointegrating vectors. On the other hand,  $\Gamma$  is the coefficient matrix related to the variables denoting the lags of the first difference of  $X_t$  vector.

Johansen cointegration method depends on finding the rank of  $\Pi$  coefficient matrix. If the rank of the  $\Pi$  matrix is zero ( $r = 0$ ), this indicates that the variables constituting  $X_t$  vector are not cointegrated. If the rank of  $\Pi$  matrix is 1, this indicates that there exists one cointegrating vector for the series constituting  $X_t$  vector. In other terms, these series may be expected to move so that they do not drift too far apart in the long run.

Johansen (1991) proposes two different tests to determine the rank of  $\Pi$  matrix or the number of cointegrating vectors. These tests are "Trace Statistics" and "Maximum Eigenvalue" tests. Trace Statistics Test

investigates the rank of  $\Pi$  matrix, and tests the null hypothesis that the rank equals to  $r$  or is smaller than  $r$ . Trace statistics can be summarized as stated below:

$$TR(r) = -T \sum_{j=r+1}^m \ln(1 - \hat{\lambda}_j) \quad (4)$$

Here,  $\hat{\lambda}_1, \hat{\lambda}_2, \dots, \hat{\lambda}_m$  denote the estimated eigenvalues which are ranked in decreasing order, and  $T$  denotes the number of observations used. Maximum Eigenvalue statistics tests the null hypothesis of the existence of  $r$  number of independent cointegrating vectors against the alternative hypothesis  $r + 1$  number of cointegrating vectors, and is expressed as given below:

$$MX(r) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (5)$$

If the statistics calculated in each tests are larger than the critical values at a given significance level, the null hypothesis will be rejected, and it will not be rejected if otherwise.

If the series are cointegrated, Vector Error Correction (VEC) Mechanism can be used to model the series. The VEC has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The VEC is given as below:

$$D_t = \mu_1 + \sum_{i=1}^{p-1} \lambda_{1,i} \Delta I B_{t-i} + \sum_{i=1}^{p-1} \delta_{1,i} \Delta F D_{t-i} + \alpha_1 (I B_{t-1} - \beta_1 F D_{t-1}) + e_{1,t} \quad (6a)$$

$$B_t = \mu_2 + \sum_{i=1}^{p-1} \lambda_{2,i} \Delta I B_{t-i} + \sum_{i=1}^{p-1} \delta_{2,i} \Delta F D_{t-i} + \alpha_2 (I B_{t-1} - \beta_2 F D_{t-1}) + e_{2,t} \quad (6b)$$

*IB* stands for the logarithm of economic growth. *FD* represents the logarithm of financial development indicator.  $\beta_i$  ( $i = 1, 2$ ) denotes the coefficient of the cointegrating vector.  $\alpha_i$  ( $i = 1, 2$ ), the coefficient of the lagged error correction term, measures the speed of adjustment of the  $i$ -th endogenous variable towards the equilibrium.

As explained above, the presence of a cointegrating relation forms the basis of the VEC specification. The error correction terms of VEC may be used to estimate the direction of long run causality. In this case, the fact that  $\alpha_1$  coefficient is significant in the equation number (6a) indicates that *IB* is the cause of *FD* in the long run, and the fact that  $\alpha_2$  coefficient is significant in the equation number (6b) indicates that *FD* is the cause of *IB* in the long run. In order to determine the short run causality relation, Wald tests may be applied. In this respect, for the equation number (6a), if the  $\lambda_{1,i}$  coefficients related to the lagged values of *IB* variable are found to be significant as a whole, it can be stated that *IB* variable is the Granger cause of *FD* variable in the short run. Similarly, if the significance of  $\delta_{2,i}$  coefficients related to the lagged values of *FD* variable in equation (6b) cannot be rejected, it can be expressed that *FD* variable is the Granger cause of *IB* variable in the short run.

If the series are not the first-difference stationary, Johansen cointegration methods cannot be used to determine the long run relations between the variables. The Bounds Testing Approach, developed by Pesaran et al. (2001), allows for testing of cointegration relation, even though there is no precise information on whether the regressors are  $I(0)$  or  $I(1)$ . Bounds test is based on the following dynamic error correction models ECM:

$$\Delta FD_t = \mu_1 + \alpha_1 IB_{t-1} + \beta_1 FD_{t-1} + \sum_{i=1}^{p-1} \lambda_{1,i} \Delta IB_{t-i} + \sum_{i=1}^{p-1} \delta_{1,i} \Delta FD_{t-i} + \omega_1 \Delta IB_t + e_{1,t} \quad (7a)$$

$$\Delta IB_t = \mu_2 + \alpha_2 IB_{t-1} + \beta_2 FD_{t-1} + \sum_{i=1}^{p-1} \lambda_{2,i} \Delta IB_{t-i} + \sum_{i=1}^{p-1} \delta_{2,i} \Delta FD_{t-i} + \omega_2 \Delta FD_t + e_{2,t} \quad (7b)$$

Pesaran et al. (2001) propose applying the familiar F-test with new critical values that they tabulate. Therefore, null of no cointegration, i.e.  $H_0^{\alpha_i}: \alpha_i = 0, H_0^{\beta_i}: \beta_i = 0$  for  $i = 1, 2$  is tested against the alternative of  $H_0^{\alpha_i}: \alpha_i \neq 0, H_0^{\beta_i}: \beta_i \neq 0$  for  $i = 1, 2$ . The critical values that are tabulated consist of an upper bound on the assumption that all variables are integrated of order one and a lower bound on the assumption that all variables are integrated of order zero. If the computed F statistics exceed the upper bound, the conclusive decision can be made in favor of the cointegration.

If the series are cointegrated, error correction models (ECM) given in (6a) and (6b) equations can be used to determine the causal relationship between the economic growth and financial development. The F-statistics on the lagged explanatory variables of the ECM indicates the significance of the short-run causal effects. The t-statistics on the coefficients of the lagged error-correction term indicates the significance of the long-run causal effect.

## 5. Estimation Results

Johansen Cointegration Technique and ECM described in the previous section relies on the assumption that both the financial development (FD) and economic growth (IB) series are I(1) processes. Therefore, prior to estimation of the ECMs, we test stationarity of the variables concerned. Table 4 presents the conventional ADF test results. As can be seen from the Table 4, the ADF tests suggest that both economic growth series and financial development indicators contain a unit root except for STY.

In order to check if there is a cointegration relationship between the variables, we employed Johansen (1991) cointegration tests. However, since STY variable is not first difference stationary, Johansen Cointegration method cannot be used to determine the long-run relationship between STY and economic growth. In order to indicate if economic growth and STY are cointegrated, Bound Test developed by Pesaran et al (2001) is used.

**Table 4:** Unit Root Test Results (ADF)

| Variables |                | Intercept only | Intercept and Time Trend | Result |
|-----------|----------------|----------------|--------------------------|--------|
| BAC       | Level          | -1,869         | -2,450                   | I(1)   |
|           | 1st Difference | -7,739*        | -7,748*                  | I(0)   |
| BAY       | Level          | 0,572          | -2,278                   | I(1)   |
|           | 1st Difference | -8,272*        | -8,385*                  | I(0)   |
| CPD       | Level          | -2,172         | -2,166                   | I(1)   |
|           | 1st Difference | -9,748*        | -9,774*                  | I(0)   |
| CPY       | Level          | 0,240          | -1,954                   | I(1)   |
|           | 1st Difference | -4,359*        | -7,089*                  | I(0)   |
| DCY       | Level          | 0,137          | -1,891                   | I(1)   |
|           | 1st Difference | -4,161*        | -4,542*                  | I(0)   |
| DEPY      | Level          | 0,183          | -2,504                   | I(1)   |
|           | 1st Difference | -8,708*        | -8,732*                  | I(0)   |
| M2Y       | Level          | -0,744         | -2,074                   | I(1)   |
|           | 1st Difference | -4,419*        | -4,338*                  | I(0)   |
| STY       | Level          | -5,080*        | -4,297*                  | I(0)   |
|           | 1st Difference | -8,687*        | -7,787*                  | ---    |
| Y         | Level          | -0,567         | -3,004                   | I(1)   |
|           | 1st Difference | -9,681*        | -9,632*                  | I(0)   |

Table 5 shows the results of the Bounds Test. According to the test results, when STY financial indicator is the explanatory variable, there is no cointegration relationship between economic growth and STY financial development variables. In the case when economic growth is the explanatory variable, we can accept the existence of a long run relationship with 2.5% level of confidence. According to the test results, financial development has an explanatory power of economic growth in the long-run.

**Table 5:** Bounds Testing Results for a Level Relationship between STY and Y

| Dependent Variable | Lag of Order (p) | F- statistics<br>(Unrestricted Intercepts, No trends) |
|--------------------|------------------|-------------------------------------------------------|
| STY                | 5                | 0.428630                                              |
| Y                  | 5                | 7.127406*                                             |

Note: The lag lengths of each variable in each equation were selected by applying conventional Akaike Information Criterion (AIC). The critical value of the F-statistic for upper bound and the lower bound with one regressor are 5.77 and 6.68 respectively at the 2.5% level of significance. The critical values are provided in Pesaran et al. (2001; p. 300). \* denotes significance at 2.5% level.

The financial development indicators other than STY are stationary in the first difference. Therefore, it is possible to use Johansen cointegration method. Results of the Johansen Cointegration test are sensitive to lag structure of the variables. The lag lengths of each variable in each equation were selected by applying conventional Akaike Information Criterion (AIC), and then the resultant model was tested against autocorrelation of residuals. Accordingly, the most suitable lag numbers are selected as 1, and 2, 6, 5, 5 and 1 for the first, second, third and the other models in a row, respectively. We add dummy variables (DUM94, DUM01 and DUM08) in order to take into account of the impacts of the 1994, 2001 and 2008 crises in the Turkish economy. It is observed that each of these dummy variables is significant in explaining the independent variables.

The results of the Johansen Cointegration Test are provided in Table 6. Test results suggest that there are cointegration relationships between financial development indicators and economic growth. According to the test results, it is possible to claim that a long-run relationship exists between economic growth and all financial development indicators that are used.

**Table 6:** The Results of Johansen Cointegration Tests

| Models    |        | Ho:        | Eigen v. | Trace Statistics     | Critical V.(0.05) | Prob.  |
|-----------|--------|------------|----------|----------------------|-------------------|--------|
| 1st Model | Y-BAC  | $r = 0$    | 0.190397 | 26.09*               | 25.87             | 0.0470 |
|           |        | $r \leq 1$ | 0.043581 | 4.55                 | 12.52             | 0.6625 |
| 2nd Model | Y-BAY  | $r = 0$    | 0.170234 | 19.50*               | 15.49             | 0.0118 |
|           |        | $r \leq 1$ | 0.006449 | 0.65                 | 3.84              | 0.4189 |
| 3rd Model | Y-CPD  | $r = 0$    | 0.361256 | 43.82*               | 15.49             | 0.0000 |
|           |        | $r \leq 1$ | 0.003537 | 0.34                 | 3.84              | 0.5577 |
| 4th Model | Y-CPY  | $r = 0$    | 0.213804 | 27.05*               | 25.87             | 0.0356 |
|           |        | $r \leq 1$ | 0.034851 | 3.48                 | 12.52             | 0.8158 |
| 5th Model | Y-DCY  | $r = 0$    | 0.185896 | 24.76*               | 25.87             | 0.0682 |
|           |        | $r \leq 1$ | 0.045942 | 4.61                 | 12.52             | 0.6531 |
| 6th Model | Y-DEPY | $r = 0$    | 0.166737 | 19.22*               | 15.49             | 0.0131 |
|           |        | $r \leq 1$ | 0.005964 | 0.61                 | 3.84              | 0.4347 |
| 7th Model | Y-M2Y  | $r = 0$    | 0.220268 | 25.76*               | 15.49             | 0.0010 |
|           |        | $r \leq 1$ | 0.003761 | 0.38                 | 3.84              | 0.5353 |
| Models    |        | Ho:        | Eigen v. | Max-Eigen Statistics | Critical V.(0.05) | Prob.  |
| 1st Model | Y-BAC  | $r = 0$    | 0.190397 | 21.54*               | 19.39             | 0.0239 |
|           |        | $r \leq 1$ | 0.043581 | 4.55                 | 12.52             | 0.6625 |
| 2nd Model | Y-BAY  | $r = 0$    | 0.170234 | 18.85*               | 14.26             | 0.0088 |
|           |        | $r \leq 1$ | 0.006449 | 0.65                 | 3.84              | 0.4189 |
| 3rd Model | Y-CPD  | $r = 0$    | 0.361256 | 43.48*               | 14.26             | 0.0000 |
|           |        | $r \leq 1$ | 0.003537 | 0.34                 | 3.84              | 0.5577 |
| 4th Model | Y-CPY  | $r = 0$    | 0.213804 | 23.57*               | 19.39             | 0.0116 |
|           |        | $r \leq 1$ | 0.034851 | 3.48                 | 12.52             | 0.8158 |
| 5th Model | Y-DCY  | $r = 0$    | 0.185896 | 20.16*               | 19.39             | 0.0386 |
|           |        | $r \leq 1$ | 0.045942 | 4.61                 | 12.52             | 0.6531 |
| 6th Model | Y-DEPY | $r = 0$    | 0.166737 | 18.61*               | 14.26             | 0.0097 |
|           |        | $r \leq 1$ | 0.005964 | 0.61                 | 3.84              | 0.4347 |
| 7th Model | Y-M2Y  | $r = 0$    | 0.220268 | 25.38*               | 14.26             | 0.0006 |
|           |        | $r \leq 1$ | 0.003761 | 0.38                 | 3.84              | 0.5353 |

Note: \* denotes that  $H_0$  can be rejected at 5% significance level.

In order to identify the existence and direction of the causality relationships between economic growth and financial development indicators, Vector Error Correction Mechanisms (VECM) are formed. VECM results are presented in Table 7.

**Table 7: VECM Estimation Results**

| Models              | $\alpha_1$              | $\alpha_2$             | Cointegration Equation                         |
|---------------------|-------------------------|------------------------|------------------------------------------------|
| 1st Model<br>BAC-Y  | 0.000597<br>[ 0.31626]  | 0.016056<br>[ 5.06699] | BAC = 15.8790*Y - 0.1534<br>*trend - 257.3092  |
| 2nd Model<br>BAY- Y | -0.036167<br>[-4.76064] | 0.014397<br>[ 3.26023] | BAY = 11.7586*Y - 0.1013<br>*trend - 190.4080  |
| 3rd Model<br>CPD- Y | 0.003916<br>[ 0.61283]  | 0.051118<br>[ 5.02331] | CPD = 4.9199*Y -0.0464<br>*trend - 79.7806     |
| 4th Model<br>CPY-Y  | -0.008837<br>[-1.02579] | 0.017535<br>[ 4.62992] | CPY = 18.4393*Y - 0.1612<br>* trend - 299.9305 |
| 5th Model<br>DCY-Y  | -0.335006<br>[-4.73074] | 0.004518<br>[ 0.02732] | Y = 0.01445*DCY + 0.00923<br>*trend + 16.2183  |
| 6th Model<br>DEPY-Y | -0.238141<br>[-4.92795] | 0.004992<br>[ 1.05271] | Y = 0.0287*DEPY + 0.0093<br>*trend + 16.2055   |
| 7th Model<br>M2Y-Y  | -0.179870<br>[-4.56929] | 0.274744<br>[ 4.48790] | Y = 0.1911*M2Y + 0.0071<br>*trend + 16.3233    |

Note: t values of parameter estimates are provided in square parenthesis [].

As the Table 7 reveals,  $\alpha_2$  in the 1<sup>st</sup>, 3<sup>rd</sup> and 4<sup>th</sup> models,  $\alpha_1$  in the 5<sup>th</sup> and 6<sup>th</sup> model and both in the other models are statistically significant. The significance of those coefficients imply that there are long-run relationships between economic growth and financial development indicators. Accordingly, BAC, CPD and CPY financial indicators are the long-run Granger causes of economic growth while economic growth is the long-run Granger cause of the ratios of volume of domestic credits and the total banks' deposits to GDP. In addition, while BAY and M2Y are long-run Granger causes of economic growth, economic growth is the long-run Granger cause of financial development indicators of BAY and M2Y as well.

A cointegrating equation may be interpreted as a long-run equilibrium relationship among the variables. Since we use logarithms of the variables, the coefficients in the cointegration equations that are presented in Table 7 are elasticities. In consistence with supply leading and demand following hypotheses, the estimated elasticities are all positive. The estimated coefficients imply that for example %1 increase in GDP leads to an increase by 4.9199% in the ratio of the private sector

credits to total domestic credits, and an increase by 18.4393% in the ratio of volume of the private sector credits to GDP. Increase by 1% in the ratios of the volume of total domestic credits (DCY), general deposits (DEPY) and M2Y to GDP lead GDP to increase by %0.01445, 0.0287 and 0.1911, respectively.

We use Wald tests in order to determine short run causal relationships between the variables. The test results are provided in Table 8. Since the most suitable lag number for the VAR models that 1st, 6th and 7th models are based on is 1, Wald tests cannot be applied to these VEC models. The 8th model in the table is an ECM model, which is based on the equation number (6b). D, shows the first difference of the series.

In the Table 8 the low probability values indicate that the null hypothesis that the lagged explanatory variables of the VEC and EC models are equal to zero is strongly rejected. Therefore, there are short-run causal relationships between CPD, CPY, DCY and STY and economic growth. In the short-run, economic growth increases the ratio of the private sector credits to the total domestic credits (CPD) and the ratio of ISE total traded value to GDP (STY). The direction of the short-run causal relationships between economic growth with the ratio of volume of private sector credits to GDP (CPY) and ratio of volume of total domestic credits to GDP (DCY) are bidirectional.

**Table 8:** The Results of VEC Granger Causality/Block Exogeneity Wald Tests and Wald Test

| Models    | Dependent Var. | Chi-sq   | Df | Prob.  |
|-----------|----------------|----------|----|--------|
| 2nd Model | D(BAY)         | 1.027986 | 1  | 0.3106 |
|           | D(Y)           | 2.522023 | 1  | 0.1123 |
| 3rd Model | D(CPD)         | 0.893804 | 1  | 0.3444 |
|           | D(Y)           | 3.349607 | 1  | 0.0672 |
| 4th Model | D(CPY)         | 7.914672 | 2  | 0.0191 |
|           | D(Y)           | 6.552581 | 2  | 0.0378 |
| 5th Model | D(DCY)         | 15.25060 | 4  | 0.0042 |
|           | D(Y)           | 14.34739 | 4  | 0.0063 |
| 8th Model | D(Y)           | 20.22677 | 8  | 0.0095 |

The directions of short-run and long-run causalities obtained in the analysis are summarized in Table 9 with arrows.

**Table 9:** Short and Long Run Directions of Causalities

| Variables | Directions of Causalities |                         |
|-----------|---------------------------|-------------------------|
|           | Short Run                 | Long Run                |
| Y - BAC   | -                         | BAC $\rightarrow$ Y     |
| Y - BAY   | No causality              | BAY $\leftrightarrow$ Y |
| Y - CPD   | Y $\rightarrow$ CPD       | CPD $\rightarrow$ Y     |
| Y - CPY   | CPY $\leftrightarrow$ Y   | CPY $\rightarrow$ Y     |
| Y - DCY   | DCY $\leftrightarrow$ Y   | Y $\rightarrow$ DCY     |
| Y - DEPY  | -                         | Y $\rightarrow$ DEPY    |
| Y - M2Y   | -                         | Y $\leftrightarrow$ M2Y |
| Y - STY   | Y $\rightarrow$ STY       | STY $\rightarrow$ Y     |

Note: “-” stands for no report. The reason for no report is that since the most suitable lag number for the VAR models that Y – BAC, Y - DEPY and Y - M2Y models are based on is 1, Wald tests cannot be applied to these VEC models.

## 6. Conclusion

In this study, we examine the causal relationship between financial development and economic growth in Turkey for the 1987:1-2012:2 period. We use eight different variables to indicate financial development. Johansen (1991) Cointegration Technique and Pesaran’s (2001) Bounds Testing Approaches are employed to investigate long-run causal relationships between financial development indicators and economic growth series. The test results suggest that long-run relationships exist between economic growth and all financial development indicators that are used. We use Granger causality tests based on error correction mechanisms to examine the short and long run directions of the causality between economic growth and financial development indicators. We find that the directions of the short-run and long-run causal relationships between economic growth and financial development indicators depend on the financial development indicators that are used. Thus, our findings support both supply leading and demand following hypotheses.

Our findings can be summarized as follows. First, an increase in total assets of the banking sector and an increase in the share of the banks' assets in total assets of the Central Bank and banking sector lead to economic growth in the long-run. Moreover, the increase in the ratio of volume of private sector credits to GDP and an increase in the share of private sector credits in domestic credits have positive effects on long-run economic growth rates. These results are consistent with the supply leading hypothesis. It is a known fact that the financial system makes possible the savings to be collected in one big pool and the high-return investment projects that can only be realized by major funds to be financed. These findings imply that as a result of an increase in funds in the banks and bigger amounts of funds being used as credits, more high-return investment projects may be financed, and therefore increasing saving and credit usage lead to economic growth.

Second, the economic growth causes financial development as increases in the ratios of total assets of banking sectors, total deposits and M2Y on GDP, as well as the ratio of the volume of total domestic credit to GDP in the long-run. These results are consistent with the demand following hypothesis. Those financial development indicators are related to banks' assets. Therefore, the results suggest that the banks' assets and financing demands of the real sector increase as economy grows.

Third, the long run relationship between economic growth and the ratio of the (Ratio of Total Volume of İstanbul Stock Exchange) ISE total traded value to the GDP is positive. Economic growth increases the volume of ISE's total traded value in the short run.

Our findings regarding short run are as follows. Economic growth increases the volume of total credits, the volume of private sector credits and the share of the volume of private sector credits within total domestic credits. This is consistent with demand following hypothesis. This result implies that as a result of economic growth, credit usage, especially by the private sector increases in the short run. Conversely, the increase in the volume of the total domestic credits and private sector credits have positive impact on the rate of economic growth, which are consistent with supply leading hypothesis. On the other hand, the ratio of the total assets of the banking sector to GDP is not in a causal relationship with economic growth in the short run. These findings are interpreted that total assets of the banking sector and

economic growth increase in the same magnitude so as to leave the ratio unchanged in the short run since the results also reveals that an increase in banks' assets lead to economic growth in the long run.

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