Stock Market Development and Economic Growth in Zimbabwe

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Abstract

The main purpose of this study was to explore the causal link between stock market development and economic growth in Zimbabwe using annual time series data for the period 1980 to 2008. The study evaluated the nature of the relationship between stock market development and economic growth in Zimbabwe. The stock market development was measured using two variables namely stock market size as measured by stock market capitalization as a ratio of GDP and stock market turnover as measured by the value of stocks traded as a ratio of stock market capitalisation. The study utilised advanced econometric techniques of Unit Root Tests, Vector Autoregressive (VAR) and Granger Causality Tests to explore the relationships. The empirical results showed a uni-directional causal link that runs from stock market development to economic growth and there is evidence of an indirect transmission mechanism through the effect of stock market development on investment.

Keywords: Causality, Economic Growth, Stock Market Development, Vector Autoregression, Zimbabwe

1. Introduction

Stock markets have of late become the central focus of development economists and policy makers because of the perceived benefits they provide to the economy either directly or indirectly. These benefits include savings mobilization, risk diversification and management, facilitating the exchange of goods and services, and ensuring corporate governance and control. The importance of a healthy and vibrant national stock market is underlined by numerous studies showing that a developed banking system and a robust stock exchange not only promote economic growth, but also predict it. (Comincioli and Wesleyan, 1996; Levine, 1997; and Levine and Zervos, 1998).

A number of these studies have attempted to analyse the relationship between financial development and economic growth using banking and monetary measures of financial sector development. The results obtained have varied from being uni-directional to being bi-directional. Most of the studies carried out were cross sectional and panel in nature and have failed to provide inherent features of individual countries due to inconsistencies in data across countries. This has therefore left a gap in literature that warrants further exploration. Recent studies are now trying to close this gap by considering individual country analyses based on consistent time series data. The time series data to be used should be subjected to modern econometric tests such as unit root tests and cointegration. This study will apply modern econometric tests to the analysis of the dynamic relationship between stock market development and economic growth. This is in light of the fact that a well functioning and liquid stock market should serve as a conduit to economic growth.

Theoretically, Bagehot (1873) argued in line with Schumpeter (1912) that the financial sector has a enormous role to play in the economy, that is, financial sector development will lead to economic growth through the funding of efficient projects in the economy. Patrick (1966) managed to observe two hypotheses between financial development and economic growth namely, the demand-pull and the supply-leading hypotheses. The demand pull hypothesis states that the development of the economy tends to be followed by financial sector development while the supply- leading hypothesis states that financial development leads to economic growth. McKinnon (1973) and Shaw (1973) also argued that the development of the financial sector will lead to the growth of the economy. Singh (1997) argued that the development of the financial sector may come as an obstruction to growth when it induces volatility and deters risk subdued investors from investing. Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), Levine (1991) and Saint-Paul (1992) argued theoretically that an efficient financial market raises the quality of investments, thus leading to economic growth. According to Bencivenga and Smith (1991) and Levine (1997), more liquid markets can create long-term investment and hence economic growth through lower transaction costs. Likewise, Levine and Zervos (1998) found that stock markets liquidity positively predicts aggregate economic growth.

The review of empirical literature confirms that four scenarios can be obtained about the relationship between stock market development and economic growth. The first one asserts a bi-directional causality between stock market development and economic growth (Odhiambo, 2005; Majid, 2007; Dawson 2008; and Enison and Olufisayo, 2009). An economy with a well developed stock market promotes high economic expansion through technological changes, products and services innovation. This will in turn create a high demand for the stock market products. As the stock market effectively responds to this demand, these changes will stimulate higher economic growth. Both financial and economic developments are therefore positively interdependent and their relationship could lead to bi-directional causality.

The second one confirms uni-directional causality running from stock market development to economic growth commonly referred to as the supply leading hypothesis. N'zue (2006), Argrwalla and Tuteja (2007), Levine and Zervos (1998), Deb and Mukherjee (2008), and Nowbutsing (2009) found evidence for the supply leading hypothesis. This hypothesis contends that a well functioning stock market channels limited resources from surplus units to deficit units and in so doing provide an efficient allocation of resources, thereby resulting in economic growth (Majid, 2007). Quartey and Prah (2008) subdivide this school of thought into two: the Structuralists and the Repressionists. The Structuralists are of the view that the quantity and the composition of financial variables induce economic growth by directly increasing savings in the form of financial assets, thereby spawning capital formation and hence economic growth. The Repressionists, on the other hand, contend that financial liberalisation in the form of an appropriate positive real rate of return on real cash balances is a vehicle for promoting economic growth. Therefore a more liberalised financial system will induce an increase in saving and investment and ultimately economic growth.

The third scenario is the demand-following view which states that stock market development follows economic growth. As the economy expands its demand for certain financial instruments increases, leading to the growth of these services. For example, Van Nieuwerburgh *et al.* (2006) in their study of the relationship in Belgium from 1831 to 2002 found that GDP growth caused stock market development in years 1935 to 2002.

The final view is what is referred to as the independent hypothesis which argues that stock market growth and economic growth are not causally related. This is supported by Mazur and Alexander (2001). Clearly the literature on the causal relationship between the stock market development and economic growth is inconclusive. In reviewing the literature one cannot help but suspect that the different views exist in part because of the differing methodologies used, in particular cross sectional versus time series studies, but also due to the evolving techniques.

The relationship between stock market development and economic growth has not received adequate attention in Zimbabwe. The stock market in Zimbabwe is one of the fairly developed in Africa but it is not yet clear whether it results in economic growth or is itself a result of economic growth. This nexus is little understood in Zimbabwe. The need to shed more light on the finance-growth nexus paying attention to stock market measures of financial development has motivated this study. This study seeks to evaluate the extent and nature of the relationship between stock market development and economic growth in Zimbabwe.

The contribution of this study to relevant literature lies first in its focus on stock market development and its causal link with economic growth. The motivation is derived primarily from the policy implications of the findings of such a study for developing countries like Zimbabwe. This is of significance since it will apply the Granger Causality test and Vector Autoregressive (VAR) Approach in the Zimbabwean context to investigate the dynamic relationship between stock market performance and economic performance. The view of this is coming up with recommendations for the significant role played by the stock market on economic growth. Although the Zimbabwe stock exchange has been in existence since 1946, most research studies on it concentrated on predicting stock prices (e.g. Tsuoyoshi, 1997), the maximization of returns through portfolio diversification or the applicability of asset pricing models. The study will provide an insight into the operations and effectiveness of the Zimbabwe Stock Exchange as an input into the operations of the real Zimbabwean economy.

The underlying objective of this paper is to explore the dynamic relationship between stock market development and economic growth in Zimbabwe. The rest of the paper is structured as follows; section 2 provides the data and methodology, section 3 discusses the results obtained. The paper ends with some concluding observations and policy recommendation in section 4.

2. Data and Methodology

2.1 Data Sources

The annual data for the period 1980 to 2008 are used in the empirical analysis. The data was obtained from the ZIMSTATS formally the Central Statistical Office; an official statistics publisher in Zimbabwe, United Nations Statistical Data Base, and various Zimbabwe Stock Exchange Publications. All the data was rebased to 1990 prices using the splicing method for consistency.

2.2Methodology

The study used a vector autoregressive (VAR) framework to establish the dynamic relationship between stock market development and economic growth. This was done after testing the variables of the model for unit root using the Augmented Dickey Fuller (ADF) test. The VAR methodology, although had no sound theoretical framework, can be used to test interdependence relationships among variables. In a VAR framework all variables are treated as endogenous and this is a substitute methodology to simultaneous equation models. The methodology employed innovation accounting and impulse response functions which are superior approaches to the traditional granger causality tests. However, granger causality tests were performed to further confirm the dynamic relationships.

The VAR model to be used in our analysis was of the following form;

$$X_t = \sum_{i=1}^{n} \beta_i X_{t-i} + \mu_t$$

Where $X_t = \begin{bmatrix} PCRGDP_{t-i} \\ MCGDP_{t-i} \\ VTMC_{t-i} \\ INV_{t-i} \end{bmatrix}$ which is a 4x1 vector of variables and $\beta_1 - \beta_n$ are 1x4 vector of coefficients while μ_t is a vector of error terms. PCRGDP is per capita real gross domestic product (GDP), MCGDP is the ratio of stock market capitalization to GDP, and VTMC is the ratio of value of stocks traded to market capitalisation while INV is investment as proxied by gross fixed capital formation as a ratio of GDP. If all the variables of the model are integrated of the same order, for example, I(1), then a Vector Error Correction Model (VECM) can be constructed in which all variables enter the above model in their first differences. However, if not cointegrated, an unrestricted VAR model will be estimated. In that case, variance decomposition permits inferences to be drawn regarding the proportion of the movement in a particular time series due to its own earlier “shocks” vis-à-vis “shocks” arising from other variables in the VAR model while the impulse response function traces the time path of the effects of “shocks” of other variables contained in the VAR on a particular variable.

2.2.1 Definition and justification of variables

Economic Growth (PCRGDP): Economic growth is defined as the increase in a nation’s ability to produce goods and services over time as is shown by increased production levels in the economy. There are numerous measures used to depict economic growth and these include real gross domestic product (RGDP) growth rate, nominal gross domestic product (NGDP) per capita, real gross national product (RGNP) and real GDP per capita among others. The study employed real GDP per capita growth rate as a proxy for economic growth as it focuses on actual domestic production per person which has a bearing on the general welfare of a country’s citizens. Measures like GNP have not been considered since it measures production by Zimbabwean factors regardless of their global location. Problems arise in evaluating the well being of nationals based on production beyond Zimbabwe’s boundaries, hence real GDP per capita is the preferred proxy in line with studies by Levine and Zervos (1996) and Tuncer and Alovsat (1998).

Stock Market Size (MCGDP): A widely used indicator for stock market size is stock market capitalisation (measured as the total value of listed shares) as a ratio to GDP [see Nowbutsing (1999), Van Nieuwerburgh *et al.* (2005)]. This captures the organised trading of company stocks as a proportion of national output and should thus be positively related with economic growth.

Stock market turnover (VTMC): For liquidity and efficiency of the stock market, the stock market turnover ratio, is measured as the ratio of the value of total shares traded to market capitalisation. Turnover ratio is used as an index of comparison for market liquidity rating and level of transaction costs. It is also a measure of the value of securities transactions relative to the size of the securities market.

Investment (INV): Investment refers to an increase in capital stock in the economy and is one of the traditional determinants of economic growth. Investment can also enhance the operation of the stock market which eventually feeds into the growth of the economy. Time series data for domestic investment is not readily available, hence the adoption of gross fixed capital formation ratio to GDP as a proxy. This proxy has been used in several studies such as those by Caporale *et al*. (2003), Rateb and Junankar (2003) among others. Domestic investment is expected to exert a positive influence on economic growth.

All the variables, except PCRGDP which had some negative values, were expressed in logarithms to smoothen the data which displayed a high trend. The variables of the model became, PCRGDP, LMCGDP, LVTMC and LINV.

3. Estimation and Interpretation of Results

Before estimation was done, all the variables were tested for unit root using the Augmented Dickey Fuller (ADF) test to ensure that they enter the model as stationary variables. If variables are not stationary in levels appropriate differencing is required until the variables become stationary. In testing for stationarity, a lag of one was used due to the small sample size and thus ensuring a sufficient number of observations in the model. The results for unit root tests in levels are presented in table 1.The ADF tests showed that all variables were non stationary in levels except PCRGDP which was stationary at the 5% level of significance. This was so because the ADF test statistics were more than the critical values. Only PCRGDP had an ADF test statistic that was less than the critical value and thus was stationary in levels, implying that it was integrated of order 0 that is I (0). After first differencing (table 2), the results showed that LMC and LVTM become stationary at the 1% level of significance. However, LINV remained non-stationary and required further differencing. This meant that these two variables (LMC and LVTM) were integrated of order 1 that is I (1). After second differencing (table 3) the variable LINV became stationary at the 1% level, implying that it was integrated of order 2 [I(2)]. Since the variables were integrated of different orders they could not be cointegrated and thus we could not proceed to construct a vector error correction model (VECM). An appropriate optimal lag length was found to be 4 using the Akaike Information Criteria (AIC) and results are shown in table 4. We therefore considered an unrestricted VAR model which was constructed using stationary variables and therefore each variable entered the model according to its order of integration which means the number of times a variable should be differenced to achieve stationarity(table 5 shows the estimated VAR model).

Granger Causality Tests

Granger causality tests with results presented in table 6, which constituted the main hypothesis of the study, showed that there is a uni-directional causality that runs from stock market turnover to economic growth. The results revealed that there is no causality between stock market size and economic growth. However, stock market development had an indirect impact on economic growth in Zimbabwe via its significant influence on investment. All the variables used to measure stock market development used in the study showed that they had a positive influence on investment which is the main determinant of economic growth. The results also indicated a significant relationship that runs from investment to economic growth which is correctly supported by theory. One interpretation of this transmission mechanism is that a stock market that is larger in size leads to higher investment opportunities, rendering stock market investments a better pointer of aggregate investment. Therefore the results revealed that there is evidence for a demand following hypothesis (Real GDP per capita growth rate causes stock market turnover) and also evidence for a supply leading hypothesis via the investment channel.

Variance Decomposition

Variance decomposition functions track deviations in each of the variables. They break down the forecast error variance into components that can be directly attributed to each of the endogenous variables. These results depend on the ordering of the variables and thus presumably exogenous variables are ordered first and those that are presumably endogenous are ordered last. In this study the variables have been ordered as follows; DDLINV, DLMCGDP, DLVTMC and lastly PCRGDP. Tables 7 to 10 show the variance decomposition for these variables.

Variance Decomposition of DLVTMC: Table 7 shows the variance decomposition of stock market turnover. The forecast horizon is 10 years. The standard error for the forecast horizon steadily increases indicating uncertainties over the period. From the table we can see that stock market turnover is not purely exogenous; all the shocks are not attributable to its own shocks for any given period. In the early years much of the deviation in stock market turnover is attributable to itself especially in the 1st period (90.9%). In the second period much of the deviation in stock market turnover is attributable to investment (44.1%). Investment contributes a maximum of 56.3% of the deviation in turnover ratio and this occurs in the fourth period. Stock market size (DLMCGDP) contributes a maximum of 41.3% of the deviation in turnover ratio and this occurs in the 7th period. Economic growth (PCRGDP) contributes a maximum of 13% deviation of turnover ratio and this occurs in the second period indicating that the relationship is weak.

Variance Decomposition of DLMCGDP**:** Table 8 shows the variance decomposition of stock market size. Most of the deviations in stock market size are attributable to its own shocks in the first period. However in the 4th period investment contributes much to deviations in stock market size with a percentage of 75.3%. The stock market turnover contributes a maximum of 37.8% to deviations in stock market size and this occurs in the 10th period. The contribution of economic growth is highly insignificant contributing a maximum of 8.9% in the 8th period.

Variance Decomposition for PCRGDP: Table 9 shows the variance decomposition of PCRGDP. The variable measuring economic growth (PCRGDP) is purely not exogenous as only about two-thirds (64.7%) of the deviation in the variable are attributable to its own shocks in the first period. The impact of its own shock declines over time indicating the importance of other variables that explain economic growth. Much of the deviation in PCRGDP in the first period is attributable to stock market size (31.8%). This shows that stock market size is an important variable that explains economic growth. Stock market turnover contributes a maximum of 19% in the 10th period showing that it's a major determinant of economic growth. Investment has proved to be one of the major determinants of economic growth as shown by its significant contribution to deviations in economic growth, contributing 61.1% in the 3rd period. Its contribution has remained above 40% after the second period indicating that investment is a major cause of economic growth. Therefore the stock market variables not so significantly contributes to economic growth indicating a weak relationship that runs from stock market development to economic growth.

Variance Decomposition for DDLINV: Table 10 shows the variance decomposition for LINV. In the first period investment is purely an exogenous variable as all the 100% deviation in the variable is as a result of its own shocks. In the second period other variables started to be significant in explaining shocks in this variable as shown by a drop from 100% to 84.8%. All the other three variables in this model have become important determinants of deviations in the investment variable. Stock market turnover and stock market size contributed over 20% to the deviations in investment with stock market size contributing a maximum of 22.1% in the 8th period and stock market turnover contributing 28.4% of deviations in investment in the 7th period. PCRGDP only contributes a maximum of 11.2% in the 9th period. This shows that stock market variables are major determinants of investment in Zimbabwe, a result that tallies with the conclusions from granger causality tests.

Impulse Response Functions

The graphs for impulse response functions are presented in figure 1. These indicate how each endogenous variable responds over time to innovations or shocks to each of the endogenous variables in the model. Impulse response functions show how innovations of given endogenous variables stretch through each and every given endogenous variable and eventually how it affects the original variable itself. For stationary VARs, the impulse responses should die out to zero and the accumulated responses should asymptote to some (non-zero) constant.

In our study, the response of real GDP per capita (PCRGDP) to turnover ratio (DLVTMC) was positive from period two and beyond. This is supported by the supply-leading hypothesis by Patrick (1966). The response of PCRGDP to stock market size (DLMCGDP) was positive in the first period, negative in the second period and then positive in period three and beyond. The relationship is not clear, per se, as the granger causality results showed an indirect effect of stock market size on real GDP per capita via investment. Thus, the demand-pull hypothesis by Patrick (1966) is partially fulfilled. The response of PCRGDP to investment (DDLINV) is positive and significant. There is a sharp increase in PCRGDP for the first two periods before a gradual decline to period four and beyond. The response of PCRGDP to itself is positive and significant. The response of stock market size (DLMCGDP) to real GDP per capita (PCRGDP) is insignificant. The response of DLMCGDP to investment (DDLINV) is positive for the first three periods before declining and becoming negative by period four. The response of stock market size to both itself and to liquidity (DLVTMC) is insignificant. The response of liquidity (DLVTMC) to investment (DDLINV) is negative for the first three periods before becoming positive after period three. The response of liquidity to itself, stock market size and real GDP per capita is insignificant. The response of investment (DDLINV) to stock market size (DLMCGDP) is positive for the first two-and-a-half periods and the last half period. It peaks in the second period before plunging into the negative by the third period and rebound into positive territory in the fourth. The response of investment to itself is positive for part of the first period, rebounds to be positive by the third period before the shock dies of by the fourth period. The response of investment to liquidity and real GDP per capita is insignificant.

4. Conclusions and Policy Recommendations

4.1 Conclusions

The study undertook to test whether causality existed between stock market development and economic growth using time series data from 1980-2008. The study employed the vector autoregressive modeling technique. Unit root tests were carried out on the variables using the Augmented Dickey Fuller test. Real GDP per capita was stationary in levels; stock market size and liquidity after first differencing; and investment after second differencing.

The results of the granger causality tests showed that stock market size had no direct effect on real GDP per capita. The effect only came via investment, that is, stock market size causing investment and in turn investment causing real GDP per capita. Thus, stock market size attracts investment which will have a significant positive impact on real GDP per capita. Real GDP per capita was found to cause stock market turnover whilst a reverse causality existed between investment and stock market size. This was however in contradiction with the variance decomposition and impulse response functions and could be possibly attributed to the data distortions in Zimbabwe particularly for the period 2003 to 2008. However, the period was not too short considering the scope of the study.

The results of the variance decomposition however, showed that stock market size was a significant variable in explaining real GDP per capita. This supports the Patrick's supply leading hypothesis. Results reject reverse causality between stock market size and real GDP per capita in favour of one way causality running from stock market size to real GDP per capita (Levine and Zervos, 1996; Nowbusting, 1999; Shahzab *et al.*, 2008). Stock market turnover had an insignificant effect on real GDP per capita in earlier periods. Its influence became significant in later periods.

The impulse response functions largely showed that stock market size positively influenced real GDP growth. The reverse relationship was, however, insignificant. The impact of stock market turnover on growth was found to be positive. The impact of growth on turnover and size was found to be insignificant.

4.2 Policy Recommendations

The results, in general, suggest that stock market capitalisation and stock market turnover have a positive influence on real GDP per capita. Granger Causality tests as well as variance decomposition and impulse response functions show an indirect positive effect of stock market capitalisation on real GDP per capita via investment. It may be, on this basis, necessary to advocate for policies that can substantially influence stock market capitalisation and stock market turnover with the hope that they will significantly increase real GDP per capita.

Given that the results show that a positive influence of the stock market on economic growth, it is of utmost importance that the government prioritise the development of the stock market. This can be done through relaxing laws and regulations that have to do with listing requirements for both local and foreign investors so as to encourage more listings on the bourse. This will ensure that there are more players on the stock exchange and thus increases competition and quality of securities investments resulting in a significant influence on economic growth. The relevant authorities can also encourage more trading of on the stock market even for the already listed stocks. This can also be achieved through the enactment of favourable laws governing trading in securities such as electronic trading and timely disclosure of accurate information. Such policies would significantly increase stock market activity with resultant positive spin-offs for the economy even without going via investment.

The impact of stock market capitalisation on economic growth is indirect and operates via investment. It is thus incumbent upon government to ensure that they develop the financial sector to levels where market capitalisation will directly influence growth. One way of doing this is by ensuring efficiency in stock market trades. Currently deals are settled seven days after the transaction is concluded. This can be reduced to a period of three days to improve on efficiency. In addition, to bridge the bureaucratic gap of manual trading of stocks, on-line based trading systems could speed up transactions, attract more investment and result in the much desired growth.

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Table 1. Unit Root Tests in Levels

Variable	ADF test Statistic	1% critical Value	5% critical Value	Result
	-4.169580**	-4.3382	-3.5867	Stationary
PCRGDP				
LMCGDP	-2.396138	-4.3382	-3.5867	Non Stationary
LVTMC	-3.176792	-4.3382	-3.5867	Non Stationary
LINV	3.477409	-4.3382	-3.5867	Non Stationary

Significant at 10%, ** significant at 5% and * significant at 1%.*

Table 2. Unit Root Tests in First Differences

Variable	ADF test Statistic	1% critical Value	5% critical Value	Result
LMCGDP	-4.499315***	-4.3552	-3.5943	Stationary
LVTMC	-5.883339***	-4.3738	--3.6027	Stationary
LINV	-1.159832	-4.3738	-3.6027	Non Stationary

*Significant at 10%, ** significant at 5% and *** significant at 1%.*

Table 3. Unit Root Tests in Second Differencing

Variable	ADF test Statistic	1% critical Value	5% critical Value	Result
LINV	-6.651140***	-4.3738	-3.6027	Stationary

Significant at 10% ** significant at 5%, and * significant at 1%.*

Table 4. Optimal Lag Length Selection

Lag	AIC
1	15.9
2	16.1
3	14.9
4	13.5*

Table 5. Estimated VAR Model

Sample(adjusted): 1986 2008
Included observations: 23 after adjusting endpoints
Standard errors & t-statistics in parentheses

	DDLINV	DLMCGDP	DLVTMC	PCRGDP
DDLINV(-1)	-0.364599	1.632873	-2.203585	8.578557

	(0.52355)	(1.35037)	(0.82742)	(3.13825)
	(-0.69640)	(1.20921)	(-2.66321)	(2.73355)
DDLINV(-2)	-0.177347	6.567183	-2.696015	6.965296
	(0.72778)	(1.87714)	(1.15019)	(4.36246)
	(-0.24368)	(3.49851)	(-2.34398)	(1.59664)
DDLINV(-3)	0.064626	3.315003	-3.155458	19.08678
	(0.95744)	(2.46950)	(1.51315)	(5.73912)
	(0.06750)	(1.34238)	(-2.08536)	(3.32573)
DDLINV(-4)	-0.059741	1.930670	-1.885880	4.722739
	(0.73583)	(1.89790)	(1.16291)	(4.41072)
	(-0.08119)	(1.01727)	(-1.62169)	(1.07074)
DLMCGDP(-1)	0.063128	-0.569707	0.600374	-2.438136
	(0.23997)	(0.61894)	(0.37925)	(1.43842)
	(0.26307)	(-0.92046)	(1.58307)	(-1.69501)
DLMCGDP(-2)	0.057938	-0.598719	0.522274	-0.817973
	(0.13300)	(0.34303)	(0.21019)	(0.79721)
	(0.43563)	(-1.74536)	(2.48478)	(-1.02604)
DLMCGDP(-3)	0.151537	-1.156522	-0.002130	-0.141425
	(0.15254)	(0.39344)	(0.24108)	(0.91437)
	(0.99342)	(-2.93948)	(-0.00883)	(-0.15467)
DLMCGDP(-4)	-0.260331	-0.608358	1.063917	-3.393325
	(0.36282)	(0.93581)	(0.57340)	(2.17481)
	(-0.71752)	(-0.65009)	(1.85545)	(-1.56028)
DLVTMC(-1)	0.073689	0.592965	-0.874882	0.522009
	(0.26547)	(0.68471)	(0.41955)	(1.59127)
	(0.27758)	(0.86600)	(-2.08530)	(0.32804)
DLVTMC(-2)	0.215467	0.647744	-1.074714	2.462785
	(0.21985)	(0.56705)	(0.34745)	(1.31783)
	(0.98006)	(1.14230)	(-3.09312)	(1.86882)
DLVTMC(-3)	0.473852	-0.240374	-1.052822	2.522653
	(0.39054)	(1.00731)	(0.61721)	(2.34098)
	(1.21333)	(-0.23863)	(-1.70577)	(1.07761)
DLVTMC(-4)	-0.303654	-1.061674	1.016741	-1.380830
	(0.41181)	(1.06218)	(0.65083)	(2.46850)
	(-0.73736)	(-0.99952)	(1.56221)	(-0.55938)
PCRGDP(-1)	0.057792	0.059261	-0.248502	0.831642
	(0.05369)	(0.13847)	(0.08485)	(0.32182)
	(1.07644)	(0.42796)	(-2.92878)	(2.58422)
PCRGDP(-2)	0.010184	0.019531	0.028273	-0.288101
	(0.04152)	(0.10708)	(0.06561)	(0.24886)
	(0.24529)	(0.18238)	(0.43089)	(-1.15766)
PCRGDP(-3)	0.030655	-0.190864	0.068484	0.592702
	(0.06407)	(0.16525)	(0.10126)	(0.38405)
	(0.47846)	(-1.15498)	(0.67634)	(1.54330)
PCRGDP(-4)	-0.031801	-0.279260	0.279458	-0.910464
	(0.05344)	(0.13782)	(0.08445)	(0.32030)
	(-0.59513)	(-2.02620)	(3.30916)	(-2.84250)
C	-0.154109	0.285047	0.004094	0.394936
	(0.17243)	(0.44474)	(0.27251)	(1.03357)
	(-0.89376)	(0.64093)	(0.01502)	(0.38211)
R-squared	0.846032	0.923892	0.954805	0.876164
Adj. R-squared	0.435451	0.720937	0.834285	0.545934
Sum sq. resids	2.081133	13.84497	5.198005	74.77629
S.E. equation	0.588944	1.519044	0.930771	3.530257
F-statistic	2.060573	4.552194	7.922360	2.653195
Log likelihood	-5.005894	-26.79851	-15.53256	-46.19416
Akaike AIC	1.913556	3.808566	2.828919	5.495145
Schwarz SC	2.752834	4.647844	3.668197	6.334423
Mean dependent	-0.118826	0.103520	0.222070	-2.176956
S.D. dependent	0.783833	2.875537	2.286448	5.238982
Determinant Residual Covariance		0.023526		
Log Likelihood		-87.42132		
Akaike Information Criteria		13.51490		
Schwarz Criteria		16.87201		

Table 6.Granger Causality Tests using Lag 4.

Null Hypothesis:	Observations	F-Statistic	Probability
1. DDLINV does not Granger Cause PCRGDP	23	2.49972*	0.09004
PCRGDP does not Granger Cause DDLINV		0.74958	0.57449
2. DLMCGDP does not Granger Cause PCRGDP	24	0.15335	0.95853
PCRGDP does not Granger Cause DLMCGDP		0.71559	0.59419
3. DLVTMC does not Granger Cause PCRGDP	24	0.57721	0.6836
PCRGDP does not Granger Cause DLVTMC		2.38176*	0.09792
4. DLMCGDP does not Granger Cause DDLINV	23	2.82229*	0.06573
DDLINV does not Granger Cause DLMC		5.30693***	0.00817
5.DLVTMC does not Granger Cause DDLINV	23	0.55363	0.69975
DDLINV does not Granger Cause DLVTMC		2.31456	0.10841
6.DLVTMC does not Granger Cause DLMCGDP	24	0.89168	0.49283
DLMCGDP does not Granger Cause DLVTMC		1.1654	0.36501

**significant at 10% **; significant at 5%; ***significant at 10%.*

Table 7. Variance Decomposition of turnover ratio (DLVTMC)

Period	S.E.	DDLINV	DLMCGDP	DLVTMC	PCRGDP
1	0.475395	7.092325	1.987219	90.92046	0
2	0.980069	44.11134	8.138988	34.21833	13.53134
3	1.04126	48.69368	7.512368	31.26606	12.5279
4	1.515797	56.31909	18.74534	18.64337	6.292204
5	1.589928	55.70602	18.05117	17.47246	8.770351
6	1.708686	51.66959	20.5838	15.94882	11.79779
7	2.38291	27.35389	41.29736	25.28239	6.066356
8	2.753363	21.14472	41.06893	30.37654	7.40982
9	3.004487	33.65187	34.57114	25.52388	6.253114
10	3.371904	34.94604	36.02214	22.76615	6.265669

Table 8. Variance Decomposition of Stock Market Size (DLMCGDP)

Period	S.E.	DDLINV	DLMCGDP	DLVTMC	PCRGDP
1	0.775858	0.127623	99.87238	0	0
2	1.026873	19.15191	73.8385	6.308621	0.700972
3	1.639535	68.22992	28.97584	2.494087	0.300157
4	1.909699	75.33932	21.50021	2.722015	0.438459
5	1.94315	75.20547	20.88453	3.264058	0.645945
6	2.569505	60.23929	23.28694	14.83352	1.640256
7	3.435788	34.25751	25.93384	32.06395	7.744696
8	3.723933	35.23104	25.42874	30.34325	8.996971
9	4.133021	28.88441	32.87032	29.9476	8.297667
10	5.134449	19.36175	37.08502	37.7939	5.759324

Table 9. Variance Decomposition of Economic Growth (PCRGDP)

Period	S.E.	DDLINV	DLMCGDP	DLVTMC	PCRGDP
1	1.803093	2.424451	31.80268	1.035103	64.73777
2	3.715723	57.98389	15.93351	0.294928	25.78768
3	4.249539	61.1557	12.20188	2.372558	24.26986
4	5.096817	47.70318	21.50751	8.40191	22.38739
5	5.825979	45.30333	19.27061	16.76276	18.6633
6	5.937761	46.31752	18.97448	16.14903	18.55897
7	6.656402	52.75664	15.26994	13.59168	18.38174
8	7.345282	51.62796	13.96042	11.24757	23.16405
9	7.938108	44.2621	14.20397	15.13845	26.39548
10	8.387234	40.37893	16.63869	18.97543	24.00695

Table 10. Variance Decomposition of Investment (DDLINV)

Period	S.E.	DDLINV	DLMCGDP	DLVTMC	PCRGDP
1	0.300806	100	0	0	0
2	0.345719	84.84654	8.837111	0.434995	5.881351
3	0.377231	78.67702	10.44844	5.179023	5.695516
4	0.432167	60.15181	20.73502	14.77064	4.342528
5	0.556379	37.79325	19.59109	37.06253	5.553137
6	0.699746	49.63291	13.13379	28.39207	8.841218
7	0.749594	48.92636	15.48824	24.75257	10.83283
8	0.804752	43.55108	22.06682	24.21721	10.1649
9	0.812203	43.36502	21.67379	23.78611	11.17509
10	0.961811	55.88865	16.1729	19.49225	8.446202

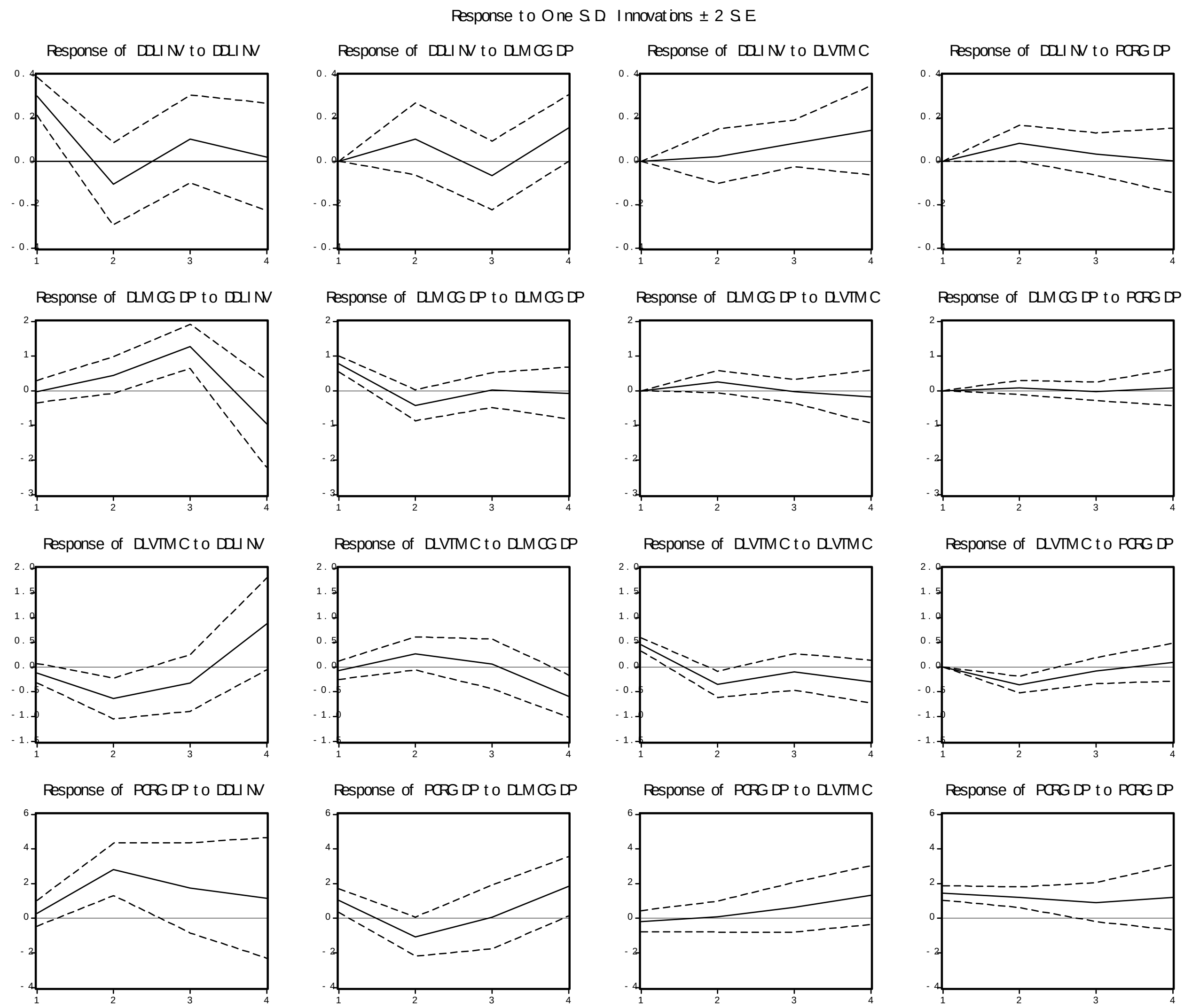

Figure1. Impulse Response Functions