STOCK MARKET DEVELOPMENT AND ECONOMIC GROWTH: EVIDENCE FROM KENYA

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Abstract

The main purpose of this study was to explore the relationship between the stock market development and economic growth by establishing a causal link between them using annual time series data for the period 1990 to 2014. The study utilised econometric techniques such as Unit Root Tests, Vector Autoregressive model and Granger Causality Tests. The empirical results did not show a direct link between economic growth and the stock market. However, they showed that foreign direct investment granger causes the stock market variables and therefore has an impact on the growth in size and liquidity of the Kenyan stock market.

Key Words: Economic Growth, Stock Market Development, Granger Causality, Vector Autoregression

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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1. Introduction

1.1 Background of the Study

Stock markets are a vital component for economic development as they provide listed companies with a platform to raise long-term capital and also provide investors with a forum for investing their surplus funds.

In developing countries however, stock markets have been viewed by some analysts as casinos that have little positive impact on economic growth. Recent research provides evidence that stock markets can give a big boost to economic development. This therefore signifies the importance of financial markets. Demirguc-Kunt and Levine (1995) found that the level of stock market development is highly correlated with the development of banks, nonbank financial institutions, insurance companies and private pension funds. Stock market activities such as efficiently allocating capital for investment and providing an appropriate platform to generate best corporate practices thus result in increased investment which leads to growth of the economy.

Stock markets mainly affect economic activity through the creation of liquidity. Enhanced liquidity, therefore, facilitates investment in longer-run, higher-return projects that boost productivity growth. Levine and Zervos (1998) find that stock market liquidity is a robust predictor of real per capita gross domestic product (GDP) growth, physical capital growth and productivity growth. Liquid markets make investments less risky thus more attractive and this leads to more investment. Liquidity also influence corporate governance in that since more liquidity makes it easier to sell shares, some argue that more liquidity reduces the incentives of shareholders to undertake the costly task of monitoring managers. (Levine, 1996)

The benefits of having a vibrant stock market include savings mobilization, risk diversification and management, facilitating the exchange of goods and services, and ensuring corporate governance and control. Thus, a robust stock exchange not only promotes economic growth, but also predicts it.

1.1.1 Economic Growth

Economic growth refers to an increase in the gross domestic product (GDP) over the years for an economy. It is measured in either nominal terms which includes inflation or in real terms meaning it has been adjusted for inflation. Economic development refers to the increase in GDP per capita over the years and the improvement of the quality of life of the people. Factors leading to economic growth include the accumulation of capital and an increase in technological innovations. Features of economic growth include appropriate allocation of capital, mobilizing and pooling of savings, risk amelioration and improvement in monitoring of investments and corporate governance. The features are enables either due to the accumulation of capital whereby it enables proper allocation of resources which leads to an increase in the level of investments which leads to diversification and eventually leads to economic growth. Technological innovations have enhanced monitoring of investments and corporate governance for example through the automation of the stock exchange, it has eliminated the need for agency intermediation as investors can log onto the system and personally make the trades.

1.1.2 Stock Market Development

Stock market development refers to the expansion of the stock market through an increase in market capitalization due to an increase in the number of companies listed or an increase in the liquidity of the market due to an increase in the trading of the shares.

Stock markets in underdeveloped countries can be a channel through which to promote economic growth thus it is paramount that the governments of those countries take action so as to enhance the development of the stock market. Some of the factors through which to promote this development include automation of the stock exchange so as to speed up operations and activities of the exchange and reduce cost associated with manual systems. Privatization of state-owned firms induces better corporate governance systems and increases access to services provided on the exchange such as access to information since listed companies require disclosure. Another factor is the promotion of institutional investors who favour greater transparency and market integrity in both primary and secondary markets, seek lower transaction cost, and encourage efficient trading and settlement facilities which forces the companies to be more competitive and efficient. The governments should also enhance regulation and supervision as this enhances stability of the system and also promotes better transparency, disclosure and enforcement requirements. They should also aim to increase public knowledge about the functioning of the stock market as this helps increase the investor base and improve liquidity of the stock market. Thus, following from the above, it is evident that for stock markets in underdeveloped countries to develop, they must take on certain changes which enable the market to deepen through the increase of more listed companies and more investors. This will improve the liquidity and capitalization of the market and thus as evidenced will lead to an increase in the growth of the economy.

1.1.3 Economic Growth and Stock Market Development

Numerous research has been carried out to determine the relationship between stock market development and economic growth. Researchers such as a Levin and Zervos have written extensively on different aspects of this relationship such as including the impact of the banking sector to the stock market and to economic growth while others such as Demirguc-Kunt looked at the impact of the stock market development to all financial intermediaries including banks. Majority of the research has found that a positive relationship exists with most stating that stock market development leads to economic growth. However, there is some research that conclude that economic growth leads to stock market development while some say that it is a bi-directional relationship. Some of the research has also stated that a negative relationship exists between the two such that an increase in either growth or development leads to a decrease in the other.

1.1.4 The Nairobi Securities Exchange

The Nairobi Securities Exchange came to be in 1954 when it was registered under the Societies Act (1954) as Nairobi Stock Exchange (NSE). It was a voluntary association of stockbrokers and was charged with the responsibility of developing the securities market and regulating trading activities. At that time, it was an East Africa bourse and most of the securities listed were state-owned by the three countries Kenya, Uganda and Tanzania. After the East Africa Community (EAC) collapsed in 1975, the NSE became the Kenyan bourse. It had its first privatization in 1988 through the successful sale of a 20 percent stake in Kenya Commercial Bank. In 1991, NSE was registered as a private company limited by shares and thus opened a trading floor. In 1994, the number of stockbrokers increased by seven largely due to the Capital Markets Act (Amendments) policies at the time. The next year an additional eight stockbrokers were licensed and the total number was then twenty. In 1996, Kenya Airways became privatized with more than 110,000 shareholders acquiring a stake. This was lauded by the World Bank for being a success story in privatization of state-owned companies. The Central Depositories Act was operationalized in June 2003. In September 2006, the bourse implemented live trading and extended the trading hours. In 2008 they increased the trading hours to six hours. The NSE All-Share Index was introduced in 2008 to provide investors with a comprehensive performance benchmark. In June 2008, Safaricom's IPO increased the number of shares listed to 55 billion shares from 15 billion. In 2009, NSE started the automated trading in government bonds. This was so as to promote investors to also invest in the government bonds by making the process easier and more accessible. On July 6, 2011 the bourse changed its name to Nairobi Securities Exchange Limited which signified their aim to evolve into a full securities exchange which supports trading, clearing and settlement of equity, debt, derivatives and other securities. In October 2012, NSE together with FTSE International launched the FTSE NSE Kenyan Shilling Government Bond Index. This was the first instrument of its kind in Eastern Africa and gave investors the opportunity to access current information and provided a reliable indication of the Kenyan Government Bond market's performance. In January 2013, the Growth Enterprise Market Segment (GEMS) was created so as to give small and medium sized companies an opportunity to access the capital markets. Presently, this segment is growing albeit slowly as there are only 4 companies listed under it. In February 2013, Centum Investment Company became the first company in East Africa to list an equity linked note. On August 8, 2013, the NSE and the Shanghai Stock Exchange (SSE) entered into a Memorandum of Understanding (MoU). In September 2014, The NSE launched a new system for trading corporate bonds and Government of Kenya Treasury Bonds allowing on-line trading of debt securities and is integrated with the settlement system at the Central Bank of Kenya. The system is more efficient, scalable and flexible, and can support trading in bonds that have been issued in foreign currencies. In October 2014, NSE and Korea Exchange (KRX) signed a MoU in Korea, marking the beginning of collaboration between the Kenya and Korea Capital Markets. (NSE Website)

From the above, it is clear that the NSE is determined to improve and grow by introducing new and efficient systems which aim to promote more companies to list and more investors to invest in both the listed companies and government bonds, within and outside the country. It is therefore on the right track of stock market development since an increase in liquidity in the stock market enable firms acquire much needed capital quickly, hence facilitating capital allocation, investment and growth. Furthermore, stock markets also help to reduce investment risk due to the ease with which equities are traded.

1.2 Problem Statement

Levine (1996) asks the question "Do stock markets affect overall economic performance?" A lot of research has been carried out to answer this question. Goldsmith (1959) states that a country's financial structure and the changes occurring in it reflect the economic state of a country. According to Greenwood and Jovanovic (1990), financial intermediation promotes growth because it allows a higher rate of return to be earned on capital and growth in turn provides the means to implement costly financial structures. Thus, it is evident that a well-developed financial system leads to economic growth.

In underdeveloped countries, policy-makers should aim towards establishing and sustaining a dynamic stock market in order to foster economic growth. This will increase the channels which promote economic growth and therefore attract more foreign investors and thus catapult the countries into the globalized financial markets. This will increase competition, promote efficient capital allocation and risk diversification and would thus lead to more economic growth of the countries.

It is important therefore to increase the research carried out to determine the relationship between the stock market development and economic growth in underdeveloped countries. A number of studies have been carried out in Kenya. Their results show that there is a relationship between the two which may either be a uni-directional or bi-directional causal relationship.

Majority of these studies however, have focused on studying this relationship using pooled data thus comparing with a number of countries such as was done by Osamwonyi and Kasimu (2013) where they examined the causal relationship in Ghana, Kenya and Nigeria. Their findings showed that that there is no causal relationship between stock market development and economic growth in Ghana and Nigeria, but revealed a bidirectional causal relationship between stock market development and economic growth in Kenya.

Other research on Kenya has focused on the relationship between the stock market development, banking sector development and economic growth while other research has focused only the relationship using size and liquidity as stock market proxies as was done by Ikikii and Nzomoi (2013). Their research shows that stock market development impacts positively on the economic growth in Kenya.

This research also aims to study the causal relationship between the stock market development and economic growth. However, it will include a longer time period, that is, from 1990-2014 and will also include other variables that have not been used in the Kenyan studies and that is the foreign direct investment and human capital. These two variables have been included since over the years, they have helped developing countries to achieve a level of sustained growth.

1.3 Research Objectives

1. To investigate the presence of a causal relationship between stock market development and economic growth.
2. To examine the direction of the causal relationship between stock market development and economic growth.

1.4 Research Questions

1. Does a causal relationship between stock market development and economic growth manifest?
2. What is the direction of the causal relationship between stock market development and economic growth?

1.5 Significance of the Research

This research has a number of policy implications such as promoting macroeconomic stability, banking sector development, improving institutional quality and improving the laws that protect shareholders.

This research will help to promote more companies especially the small and medium sized companies to list under GEMS as they will have access to more capital. The level of investments will increase which will therefore lead to an increase in stock market activities and will consequently lead to an increase in economic growth.

By studying the effects that foreign direct investment and human capital have on economic growth, this may promote policy makers to aim to introduce policies which improve human capital and increase foreign direct investment.

2. Literature Review

2.1 Theoretical Evidence

Capital markets theory suggests that external financing constraints faced by firms are eased by a developed financial system that illuminates a mechanism through which economic growth is influenced. Bagehot (1873) and Schumpeter (1912) argue that the financial sector has an 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. Schumpeter argued that the services provided by financial intermediaries such as mobilizing savings, evaluating projects, managing risks, monitoring managers and facilitating transactions are essential for technological and economic development. Goldsmith (1959) identified the need for an efficient financial structure as this has an effect on economic growth. Robinson (1952) contends that financial development simply follows economic growth. Patrick (1966) states that an observed characteristic of the process of economic development over time, in a market-oriented economy using the price mechanism to allocate resources, is an increase in the number and variety of financial institutions and a substantial rise in the proportion not only of money but also of the total of all financial assets relative to GNP and to tangible wealth. McKinnon (1973) and Shaw (1973) also concluded that the development of the financial sector will lead to growth of the economy.

Bencivenga and Smith (1991) and Levine (1991) propose endogenous growth models to identify the channels through which financial markets affect long-run growth. Levine demonstrates that stock markets accelerate growth through facilitating the ability to trade ownership of firms without disrupting the productive processes occurring within firms and also by allowing agents to diversify portfolios. The model implies that in the absence of stock markets, agents would be discouraged to invest because of risk aversion. Bencivenga and Smith (1991) found that the development of financial intermediation will increase real growth rates. This is because intermediaries shift the composition of savings towards capital, causing intermediation to be growth promoting. Pagano (1993) also uses an endogenous growth model to conclude that the steady state growth rate depends positively on the percentage of savings diverted to investment. Thus, financial deepening affects growth through converting savings to investments. Greenwood and Jovanovic (1990) endogenously determine the extent of financial intermediation and the rate of economic growth. They find that financial intermediation promotes growth because it allows a higher rate of return to be earned on capital, and growth in turn provides the means to implement costly financial structures. Thus, the development of financial intermediation will increase real growth rates.

King and Levine (1993) carried out cross-country analysis for 80 developing and developed countries with the aim to determine whether the financial system can promote economic growth. They find that indicators of the level of financial development such as size of the intermediary sector relative to gross domestic product (GDP), importance of banks relative to the central bank and ratio of credit issued to private firms to GDP are strongly and robustly correlated with growth, the rate of physical capital accumulation, and improvements in the efficiency of capital allocation. They also find that financial development significantly predicts growth.

Levine (1997) shows that stock markets help protect investors against idiosyncratic risk by providing firms with the opportunity to hold a diversified portfolio. Obstfeld (1994) shows that international risk sharing through internationally integrated stock markets improves resource allocation and can accelerate the rate of growth.

Schwert (1990) found similar results to Fama in that there is a strong positive relation between real stock returns and future production growth rates. Levine and Zervos (1998) showed that stock market liquidity and banking development both positively predict growth, capital accumulation and productivity improvement. Demirguc-Kunt and Levine (1995) conclude that the level of stock market development is highly correlated with the development of banks, nonbank financial institutions (finance companies, mutual funds, and brokerage houses), insurance companies, and private pension funds.

Stock market development and economic growth is not always positive. A number of studies have proven a negative relationship. Bhide (1993) in his paper 'The Hidden

Costs of Stock Market Liquidity' states that active stockholders who reduce agency costs by providing internal monitoring also reduce stock liquidity by creating information asymmetry problems. Conversely, stock liquidity discourages internal monitoring by reducing the costs of 'exit' of unhappy stockholders. Thus, the benefits of stock market liquidity must be weighed against the costs of impaired corporate governance.

Singh (1997) explains that the development of developing countries financial system has been due to establishment and fast expansion of stock markets. The stock markets have played a key role in internal and external financial liberalisation, however, this is likely to hinder rather than assist their development due to effects such as high real interest rates.

Stiglitz and Weiss (1981) state that when credit restrictions are imposed, the level of investment decreases. In addition, in efficient capital markets, information is easily available to a common investor and as such, they can do appropriate investments which reduce the investors' burden in gathering additional information. This is reinforced by Kyle (1985).

The above studies promoted the research on the relationship between the financial market development and economic growth. Majority of the research carried out nowadays show that there is a positive relationship between the stock market development and economic growth.

2.2 Empirical Research

Levine and Zervos (1996) carried out cross-country regressions of forty one countries over the period from 1976 to 1993 with the aim to determine whether the financial system is important for economic growth. Their results suggest that stock market development is positively and robustly associated with long-run growth.

Levine (1996) states that stock markets may affect economic activity through the creation of liquidity. This is because liquid equity markets make investment less risky and allow companies permanent access to capital raised through equity issues. Thus, liquid markets improve allocation of capital and enhance prospects of long-term growth. The liquidity measures used include the total value of shares traded as a share of the Gross Domestic Product (GDP) and the value of shares as a percentage of total GDP (turnover ratio). He therefore concluded that stock market development explains future growth.

Bencivenga and Smith (1991) focused on banking sector intermediation and concluded that the development of financial intermediation will increase real growth rates. Levine & Zervos (1998) examined whether stock markets and banks promote long-run economic growth. Both variables positively predict growth, capital accumulation and productivity improvements. The study also shows that stock markets provide different services from banks. This is in line with Levine (1996) where he examined whether stock market liquidity is correlated with banking development. His results show that greater stock market liquidity is associated with faster future growth no matter what the level of banking development while greater banking development implies faster growth no matter what the level of stock market liquidity.

The more recent empirical research generally shows a causal relationship between the financial market development and economic growth. It could either be uni-directional whereby stock market development causes economic growth or economic growth causes stock market development. It could also be bi-directional whereby stock market development and economic growth simultaneously cause each other.

2.2.1 Stock market development to economic growth

Christopoulos and Tsionas (2004) investigate the long run relationship between financial development and economic growth in 10 developing countries. There is fairly strong evidence in favor of the hypothesis that long run causality runs from financial development to growth, that the relationship is significant, and that there is no evidence of bi-directional causality. The empirical evidence also points to the direction that there is no short run causality between financial deepening and output, so the effect is necessarily long run in nature.

Caporale, Howells and Soliman (2004) investigated the relationship between the stock market and growth. The evidence obtained from a sample of seven countries suggested that a well-developed stock market can foster economic growth in the long run.

N'Zue (2006) suggests that gross domestic product and stock market development in Cote D'Ivoire are cointegrated when the control variables are included in the analysis. That is, there is a long-run relationship between these variables taken together. Moreover, there is a unidirectional causality running from stock market development to economic growth.

Adjasi and Biekpe (2006) studied the effect of stock market development on economic growth in 14 African countries using a dynamic panel data model. Their results largely show a positive relationship between stock market development and economic growth. The results reveal that the positive influence of stock market development on economic growth is significant for countries classified as upper middle income economies. The general trend in results shows that low income African countries and less developed stock markets need to grow more and develop their markets to elicit economic gains from stock markets.

Research carried out by (Hongbin) in China over the period 1995-2007 and applying the co-integration and causality analysis provided evidence of a positive and significant causal relationship going from stock market development to economic growth in the long term. The study suggested that this was due to mobilizing savings and provision of liquidity.

Similar results were recorded in Mauritius where stock market development positively affects economic growth both in the short run and long run Nowbutsing (2009). They carried out a time series analysis and constructed an error correction model to determine the short and long-run relationship. The measures used for the stock market are size and liquidity. They also included FDI and human capital development.

Nurudeen (2009) carried out this research for the Nigerian stock market using the error correction model. The results suggested that stock market development increases economic growth.

Nazir, Nawaz and Gilani (2010) in their research found that the development of stock markets is highly important in sustaining better economic growth. However, size of the market, as measured by market capitalization, has a stronger influence on economic growth than the liquidity of stock market. Foreign direct investment (FDI) as well as the development of human capital also has a strong positive relationship with the economic growth of Pakistan.

It was a similar result in Zimbabwe where the authors Zivengwa, Mashika, Bokosi and Makova (2011) carried out a time series analysis using Granger Causality tests and vector autoregressive (VAR) model from 1980 to 2008. 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.

Olweny and Kimani (2011) carried out this research for the Kenyan stock market. They used Granger causality and VAR models to determine the relationship between stock performance and economic growth. The results implied a one way causality running from stock market performance to economic growth. Ikikii and Nzomoi (2013) also found that the stock market development is positively correlated with economic growth in Kenya.

2.2.2 Economic growth to stock development

From Oskooe (2010), findings imply the causality link between economic growth and stock price fluctuations in the long run, as well as bilateral causality running between share prices and economic growth in the short run. Therefore, it can be inferred that the level of real economic activity is the main factor in the movement of stock prices in the long run and stock market plays a role as a leading economic indicator of future economic growth in Iran in the short run.

Athanasios and Antonios (2012) investigated the causal relationship between stock market development and economic growth for Greece for the period 1978-2007 using a Vector Error Correction Model (VECM). The results of Granger causality tests indicated unidirectional causality between stock market development and economic growth with direction from economic growth to stock market development. Therefore, it can be inferred that economic growth has a direct positive effect on stock market development

2.2.3 Bi-directional and no-causality

Research carried out by Osamwonyi and Kasimu (2013) examined the causal relationship and direction of causality between stock market growth in Ghana, Kenya and Nigeria. The empirical findings of the study show that there is no causal relationship between stock market development and economic growth in Ghana and Nigeria, but revealed a bidirectional causal relationship between stock market development and economic growth in Kenya. The study also showed that market capitalization and number of listed securities for the three countries both Granger cause economic growth. Bidirectional causality was found between stock turnover ratio and GDP while stock traded value was found to have a strong negative effect on GDP.

Therefore, from the above empirical and theoretical literature, it is evident that there is a relationship between economic growth and stock market development and that it is a significant study due to the numerous studies that have been carried out. It is also evident that the relationship can either be uni-directional whereby stock market development impacts growth or growth impacts stock market development. It can also be a bi-directional movement whereby they cause each other to occur simultaneously. Some research has also identified a lack of a significant relationship between stock market development and growth.

Studies that show a unidirectional from stock market development to growth include Levine and Zervos (1996), Bencivenga and Smith (1991), Christopoulos and Tsionas (2004), Caporale, Howells and Soliman (2004), N'Zue (2006), Adjasi and Biekpe (2006), Nowbutsing (2009), Nurudeen (2009), (Hongbin), Zivengwa, Mashika, Bokosi and Makova (2011) and Olweny and Kimani (2011). These studies have been carried in different parts of the world and in different economies and they prove that stock market development does lead to economic growth.

Studies that show a unidirectional causal relationship from growth to stock market development are fewer and they include Oskooe (2010) and Athanasios and Antonios (2012). On study showed a bi-directional causality. Osamwonyi and Kasimu (2013) found that the relationship is bi-directional in Kenya. They also found no relationship in Ghana and Nigeria. Other studies which show a negative relationship include Bhide (1993), Singh (1997), Stiglitz and Weiss (1981) and Kyle (1985).

This research determined the relationship between the stock market development and economic growth with a focus on the Kenyan market. From the research done on the Kenyan economy, this research differentiated itself by including a longer time period, that is, from 1990-2014 and also including other variables that have not been used in the Kenyan studies and that is the foreign direct investment and human capital. These two variables were included since over the years, they have helped developing countries to achieve a level of sustained growth.

3. Methodology

This research borrows somewhat from Levine and Zervos (1996) where they investigated the relationship between stock market development and long-run growth. It however differs in that it focuses on one country, Kenya and not multiple countries. The research also differs in that the vector autoregressive time series model is used and the model also contains additional variables. This research therefore aimed to use a causal relationship to investigate the causal relationship between the stock market performance and economic growth in Kenya.

3.1 Target Population

The target is all quoted companies on the Nairobi Securities Exchange while the performance of the overall economy is measured by the growth in GDP.

3.2 Data collection

The data used includes annual data from 1990-2014 and was collected from the World Bank database except the Human Capital Index which was collected from Federal Reserve Bank of St. Louis. The variables used include stock market indicators that measure size and liquidity and economic growth indicators.

According to Levine Zervos (1996) size of the stock market is measured using the ratio of market capitalization to GDP where market capitalization equals the total values of all the listed shares. This variable is positively correlated with the ability to mobilize capital and diversify risk. Liquidity of the stock market is measured using two variables. The first is the ratio of total values of trades to GDP. This measures the value of equity transactions relative to the size of the economy. The second variable is the ratio of the total value of trades to market capitalization, also known as turnover ratio. It measures the value of equity transactions relative to the size of the equity market. The liquidity indicators measure the degree of trading and influence growth by easing investment in large, long-term projects.

The variable used as the economic growth indicator is annual GDP growth. Other variables used include Foreign Direct Investment and Human Capital Index. These variables are included since over time they have helped countries especially developing countries to achieve a level of sustained growth. Human capital is an important determinant for growth while FDI eases the transfer of technology organizational and managerial practices, skills and access to international market. (Nazir, Nawaz, & Gilani, 2010)

3.3 Data Processing and Pre-estimation Diagnostics

The model to be used in this analysis is as follows:

$$Y_t = \alpha_0 + \beta_1 Size_t + \beta_2 Traded_t + \beta_3 Turnover_t + \beta_4 FDI_t + \beta_5 HCI_t + \varepsilon_t$$

Where:

Y_t = GDP growth

$Size_t$ = Market capitalization of listed companies (% of GDP)

$Traded_t$ = total value of stocks traded (% of GDP)

$Turnover_t$ = turnover ratio

FDI_t = Foreign direct investment (% of GDP)

HCI_t = Human Capital Index of Kenya

The first step of the research was to change the data into natural logs form so as to improve its interpretability and statistical analysis. The research then tested for stationarity using the Augmented Dickey Fuller (ADF) Test. This was so as to avoid the possibility of biased results arising from the existence of unit roots in the variables. It then tested for cointegration between the variables to determine whether a long-run equilibrium relationship among the variables existed and this was tested using the autoregressive distributed lag (ARDL) approach. The optimal lag length was then determined using. The vector autoregressive (VAR) model was then used to determine the optimal lag length using the Akaike Information Criteria. It was also used study the dynamics between the variables under study such as serial correlation and normality and also to determine whether the variables were correctly specified. The pairwise Granger causality test was then used to identify whether there was uni-directional or bi-directional causality.

4. Data Analysis

4.1 Introduction

The following section reports the results from the tests carried out in response to the objective of the study which was to investigate the presence and examine the direction of a causal relationship between stock market development and economic growth in the Kenyan economy for the period from 1990-2014. The findings presented in this chapter show that there was no direct causal relationship between economic growth and the stock market development however, economic growth significantly impacts the stock market development.

4.1.1 Stationarity

Stationarity is carried out so as to eliminate spurious regressions, that is, test statistics show a significant relationship between the variables in the regression model even though no such relationship exists between them. To avoid this problem, we test for unit roots using the Augmented Dickey-Fuller (ADF) test. The results for the unit root tests are shown in Table 1 and 2 below. All the variables were non stationary in levels except GDP which was stationary at the 5% level of significance. The variable was therefore stationary in levels, implying that it was integrated of order 0, that is, I(0). After first differencing the other variables, they became stationary at 5% level of significance implying that they are integrated of order 1, that is, I(1).

Variable	ADF Statistic	5% Significance	P-Value	Result
LGDP	-4.906496	-3.004861	0.0008	Stationary
LMKTCAP	-2.368309	-2.991878	0.1606	Non stationary
LTRADED	-1.950856	-2.991874	0.3050	Non stationary
LTURNOVER	-1.959987	-2.991878	0.3012	Non stationary
LFDI	-0.730362	-1.958088	0.3880	Non stationary
LHCI	-1.973067	-2.991878	0.2958	Non stationary

Table 1: ADF Unit Root Test in Levels

Variable	ADF Statistic	5% Significance	P-Value	Result
DMKTCAP	-4.032366	-1.956406	0.0003	Stationary
DTRADED	-4.632930	-1.956406	0.0001	Stationary
DTURNOVER	-6.786770	-2.998064	0.0000	Stationary
DFDI	-6.229042	-1.958088	0.0000	Stationary
DHCI	-4.144381	-2.998064	0.0041	Stationary

Table 2: ADF Unit Root Test in First Difference

4.2 Cointegration

From the above unit root test, we found our variables were integrated of different orders and therefore Johansen Cointegration could not be carried out as it requires that all variables should be integrated of order I(1). However, other tests could also be carried out such as Engle-Granger, Johansen-Juselius and autoregressive distributed lag (ARDL) approach. This research used the ARDL approach as it was the most suitable. Pesaran et al. (2001) developed the bounds testing to cointegration approach within the ARDL framework. The ARDL uses bound testing to test the presence of long run equilibrium relationship even when the order of integration is mixed but does not include integration of order I(2).

The results from performing the ARDL approach are as shown in Table 3. The model was carried out with trend and a constant. The number of forcing variables, k, included in the model was 5 and the bounds for k=5 at 95% interval are 3.189-4.329. The test-statistic value, which was got through the Wald Test, is below the lower bound thus there was no long-run cointegration present. Due to lack of a long-run cointegrating relationship, the vector error correction model could not be constructed and therefore vector auto regression was estimated using an unrestricted VAR model. The model was constructed using the variables when stationary. The optimal lag length was found to be 2 using the Akaike Information Criteria (AIC).

Null Hypothesis: C(3)=C(4)=C(5)=C(6)=C(7)=C(8)=0			
Test Statistic	Value	df	Probability
F-Statistic	2.760935	(6,2)	0.2896
Chi-Square	16.56561	6	0.0110

Table 3: Wald Test

4.3 Granger Causality Test

This test shows whether a causal relationship exists between the variables. That is, whether one variable causes the other. The results revealed that there is no causality between economic growth and any other variable. This implies that economic growth does not granger-cause the other variables and the other variables do not granger-cause economic growth either. Granger-causality was however observed between stock market value and stock market turnover, market capitalization and value traded, FDI and value traded, FDI and market capitalization and bi-directional causality was observed between FDI and stock market turnover. This therefore shows that stock market activity increases the size and liquidity of the stock market. It also shows that foreign direct investment plays a big role in developing the Kenyan stock market in terms of size and liquidity. The results are shown in Table 4 below.

4.4 Variance Decomposition

Variance decomposition tracks the 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. The tables in appendix 1 show these effects.

Variance Decomposition for LGDP: In the first period, GDP is purely an exogenous variable as all the 100% deviations in the variable are as a result of its own shocks. In the subsequent periods, the highest deviations are of its own effect and the rest of the variables especially HCI are highly insignificant contributing a maximum of 1.71% in the 10th period. It also showed that indicators of stock market development on economic growth have less impact in the short-term but the effect strengthens over time as GDP drops to 68% in the 10th period while market capitalization increases to 15% and value traded to 6%.

Variance Decomposition for DMKTC: Similar results are observed as with GDP, where 98.9% of the deviations are due to its own shocks in the 1st period. The impact of its own shocks declines over time indicating that other variables explain market capitalization. FDI contributes a maximum of 18.7% in the 4th period and it remains at 18% until the 10th period. GDP contributes a maximum of 10.64% in the 10th period.

The impact of FDI is in line with the granger causality test as it was shown to be the only variable that granger-causes market capitalization.

Pairwise Granger Causality Tests
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DTURNOVER does not Granger Cause LGDP	20	0.24205	0.7880
LGDP does not Granger Cause DTURNOVER		0.86912	0.4394
DTRADED does not Granger Cause LGDP	20	0.54563	0.5906
LGDP does not Granger Cause DTRADED		0.49731	0.6178
DMKTCAP does not Granger Cause LGDP	20	1.08132	0.3642
LGDP does not Granger Cause DMKTCAP		0.29567	0.7483
DHCI does not Granger Cause LGDP	20	0.53534	0.5963
LGDP does not Granger Cause DHCI		1.28384	0.3057
DFDI does not Granger Cause LGDP	20	0.60934	0.5566
LGDP does not Granger Cause DFDI		1.06817	0.3684
DTRADED does not Granger Cause DTURNOVER	22	0.46975	0.6330
DTURNOVER does not Granger Cause DTRADED		3.53739	0.0519
DMKTCAP does not Granger Cause DTURNOVER	22	1.60689	0.2295
DTURNOVER does not Granger Cause DMKTCAP		2.59165	0.1041
DHCI does not Granger Cause DTURNOVER	22	0.52277	0.6021
DTURNOVER does not Granger Cause DHCI		0.68698	0.5165
DFDI does not Granger Cause DTURNOVER	22	3.30596	0.0613
DTURNOVER does not Granger Cause DFDI		1.62004	0.2270
DMKTCAP does not Granger Cause DTRADED	22	7.90585	0.0037
DTRADED does not Granger Cause DMKTCAP		1.37943	0.2785
DHCI does not Granger Cause DTRADED	22	0.32848	0.7245
DTRADED does not Granger Cause DHCI		0.43846	0.6521
DFDI does not Granger Cause DTRADED	22	3.79034	0.0435
DTRADED does not Granger Cause DFDI		1.53821	0.2432
DHCI does not Granger Cause DMKTCAP	22	0.53092	0.5975
DMKTCAP does not Granger Cause DHCI		0.78672	0.4712
DFDI does not Granger Cause DMKTCAP	22	3.00786	0.0761
DMKTCAP does not Granger Cause DFDI		0.52201	0.6025
DFDI does not Granger Cause DHCI	22	0.02167	0.9786
DHCI does not Granger Cause DFDI		0.67005	0.5247

Table 4: Granger Causality Test

Variance Decomposition for DTRADED: For the 10 periods, market capitalization had the highest deviations with the highest being 75.95% in the 1st period and its own deviation contributing the most in the third period with 21.71%. This variance decomposition shows that stock market size is an important variable that explains the value of the stocks that are traded in the domestic market. GDP and FDI contribute 17% each from the 7th period thus showing that they are significant determinants for determining the liquidity of the stock market.

Variance Decomposition for DTURNOVER: The decomposition shows that turnover is purely not exogenous as it contributes a maximum of 4.09% in the 6th period. It is therefore not affected by its own shocks. GDP, market capitalization and value traded are the most significant variables with market capitalization contributing the highest in the 1st period with 48.42%.

Variance Decomposition for DFDI: Most of the deviations are attributable to its own shocks in the 10 periods. The contribution of GDP is the most significant compared to the other variables as it contributes the most with the highest contribution being 24.06% in the 9th period.

Variance Decomposition for DHCI: The highest contribution from this composition in the first period is through value traded with 30.33% and HCI contributing 21.27%. From the 2nd period, GDP contributes the highest, even higher than HCI. This shows that GDP is therefore the most important variable that explains HCI.

From all the variance decompositions, it can be shown that GDP and market capitalization are important variables that explain the other variables while HCI is the most highly insignificant variable.

4.5 Impulse Response Functions

The graphs presented in Figure 1 (refer to appendix 2) indicate how each endogenous variable responds over time to innovations or shocks to each of the endogenous variables in the model. The results of the impulse response functions mirror those of the variance decompositions.

5. Conclusion

5.1 Introduction

As evidenced by previous research, there has been an increasing need to determine the relationship between the stock market and generally the financial system and economic growth. This is because the development of the stock market leads to economic growth in some economies and therefore serves as an important channel for economic growth.

5.2 Summary of the Study

The aim of this study was to test the relationship between stock market development and economic growth using time series data from 1990-2014 in the Kenyan economy. The study employed the vector autoregressive modelling technique. Unit root tests were first carried out to determine the order of stationarity. It was found that all the variables were stationary after first differencing while the dependent variable GDP was stationary at level.

The results of the granger causality tests showed that GDP had no effect on any variable. However, the tests showed causality among the other variables. Uni-directional causality was found between value traded to stock market turnover, market capitalization to value traded, FDI to value traded and FDI to market capitalization. Bi-directional causality was observed between FDI and stock market turnover.

The results of the variance decomposition and impulse response functions showed almost similar results to granger causality. However, granger causality showed no effect of GDP while in the variance decompositions, GDP was a highly significant variable in all the variables and market capitalization too.

Thus, in conclusion, the research was not able to prove the causal relationship between stock market development and economic growth. This means that economic growth does not directly impact the stock market development whether through size or liquidity. This result deviates from previous research on Kenyan data which show either a uni-directional relationship such as in the research carried out by Olweny and Kimani (2011) or a bi-directional causality such as in Osamwonyi and Kasimu (2013). However, it showed that foreign direct investment granger causes the stock market variables and therefore has an impact on the growth in size and liquidity of the Kenyan stock market. This result is similar to that of Nowbutsing (2009) who found that FDI is positive and highly significant. Variance decomposition also showed that economic growth significantly impacts stock market size and liquidity, foreign direct investment and human capital. It also showed that indicators of stock market development on economic growth have less impact in the short-term but the effect strengthens over time similarly to what was observed by (Hongbin) in China.

5.3 Policy Recommendations

Foreign direct investment flows have been on a steady increase to African economies. The Governments of African countries, in this case the Kenyan Government, should therefore take advantage of this by implementing policies that facilitate the ease of investing in the stock market and increasing efficiency for example through automation of the stock market. They should also relax policies for investing in the stock market which will enable more companies from different sectors to list on the exchange. This will offer diversification opportunities to the foreign investors and thus will encourage them to invest more in the market. This will lead to an increase in the activity of the stock market and as has been proven by previous research, it will eventually lead to an increase in economic growth.

The government should also implement policies that will ensure relative stability in the financial sector which will therefore foster capital formation and increased investment in the sector. The policies set should be regulated and supervised as this will promote better enforcement, transparency and disclosure.

Another policy measure by the government is to propagate knowledge to the public about the benefits of investing in the stock market. These incentives would promote both domestic and foreign investments to penetrate the domestic economies and thus help draw immense benefits from these sources of capital.

There should also be an improvement in the financial structures and an increase in the variety of financial products and services as this will increase efficiency and investment. The stock market will therefore increase in size and liquidity and would be comparable to those of emerging and developed countries.

5.4 Limitations of the study

The study uses annual data which provided a small sample and therefore some of the tests were not efficiently carried out. Thus, the results could be improved through use of a sample with monthly or quarterly data.

5.5 Areas for Further Research

This study has contributed to the research on the relationship between the stock market and economic growth by including the effects of FDI and HCI to the stock market variables. It was found that FDI was an important factor that promotes the development of the stock market. The impact of HCI on this study did not show a significant impact to any of the other factors while GDP significantly impacted all the independent variables used in the study.

Therefore, this study can be improved first by increasing the data sample by using monthly or quarterly data as this improves the efficiency of the research. The study can also include other control variables other than FDI and HCI such as inflation which shows the price fluctuations. Future research may also include the comparison of the financial sector to other sectors of the economy so as to determine which sectors impact economic growth the most.

References

Adjasi, C. K., & Biekpe, N. B. (2006). Stock Market Development and Economic Growth: The Case of Selected African Countries. *African Development Bank*, 144-161.

Athanasios, V., & Antonios, A. (2012). Stock market development and economic growth an empirical analysis. *American Journal of Economics and Business Administration, 4 (2)*, 135-143.

Bagehot, W. (1873). *A Description of the Money Market.* London: Henry S. King and Co.

Bencivenga, V. R., & Smith, B. D. (1991). Financial Intermediation and Endogenous Growth. *The Review of Economic Studies, 58(2)*, 195-209.

Bhide, A. (1993). The hidden costs of stock market liquidity. *Journal of Financial Economics, 34*, 31-51.

Caporale, G. M., Howells, P. G., & Soliman, A. M. (2004). Stock MarkeT Development and Economic Growth:. *Journal of Economic Development, 29(1)*, 33-50.

Christopoulos, D. K., & Tsionas, E. G. (2004). Financial development and economic growth: evidence from panel unit root and cointegration tests. *Journal of Development Economics, 73*, 55-74.

Demirguc-Kunt, A., & Levine, R. (1995). *Stock Market Development and Financial Intermediaries: Stylized Facts.* The World Bank.

Goldsmith, R. W. (1959). The Comparative Study of Economic Growth and Structure. *National Bureau of Economic Research*, 114-123.

Greenwood, J., & Jovanovic, B. (1990). Financial Development, Growth, and the Distribution of Income. *The Journal of Political Economy, 98(5)*, 1076-1107.

Hongbin, D. (n.d.). Stock Market Development and Economic Growth: Evidence of China. 224-229.

Ikikii, S. M., & Nzomoi, J. N. (2013). An Analysis of the Effects of Stock Market Development on. *International Journal of Economics and Finance, 5(11)*, 145-151.

King, R. G., & Levine, R. (1993). Finance and Growth: Schumpeter Might be Right. *The Quarterly Journal of Economics, 108(3)*, 717-737.

Kyle, A. S. (1985). Continuous Auctions and Insider Trading. *Econometrica, 53(6)*, 1315-1336.

Levine, R. (1991). Stock Markets, Growth and Tax Policy. *Journal of Finance, 46(4)*, 1445-1465.

Levine, R. (1996). Stock Markets: A Spur to Economic Growth. *Finance and Development*, 7-10.

Levine, R. (1997). Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature, XXXV*, 688-726.

Levine, R., & Zervos, S. (1996). Stock Market Development and Long-Run Growth. *The World Bank Economic Review, 10(2)*, 323-339.

Levine, R., & Zervos, S. (1998). Stock markets, Banks and Economic Growth. *The American Economic Review, 88(3)*, 537-558.

McKinnon, R. I. (1973). *Money and capital in economic development.* Washington, DC: Brookings Institution.

Nazir, M. S., Nawaz, M. M., & Gilani, U. J. (2010). Relationship Between Economic Growth and Stock. *African Journal of Business Management, 4(16)*, 3473-3479.

Nowbutsing, B. M. (2009). Stock Market Development And Economic Growth: The Case Of Mauritius. *International Business & Economics Research Journal, 8(2)*, 77-88.

Nurudeen, A. (2009). Does Stock Market Development Raise Economic Growth? Evidence From Nigeria. *The Review of Finance and Banking, 1(1)*, 15-26.

N'zue, F. F. (2006). Stock Market Development and Economic Growth: Evidence from Cote D'Ivoire. *African Development Bank*, 123-143.

Obstfeld, M. (1994). Risk-Taking, Global Diversification, and Growth. *The American Economic Review, 84(5)*, 1310-1329.

Olweny, T. O., & Kimani, D. (2011). Stock Market Performance and Economic Growth: Empirical Evidence from Kenya using Causality Test Approach. *Advances in Management & Applied Economics, 1(3)*, 153-196.

Osamwonyi, I. O., & Kasimu, A. (2013). Stock Market and Economic Growth in Ghana, Kenya and Nigeria. *International Journal of Financial Research, 4(2)*, 83-98.

Oskooe, S. A. (2010). Emerging Stock Market Performance and Economic Growth. *American Journal of Applied Sciences, 7(2)*, 265-269.

Pagano, M. (1993). Financial markets and growth: an overview. *European Economic Review, 37*, 613-622.

Patrick, H. T. (1966). Financial Development and Economic Growth in Underdeveloped Countries. *Economic Development and Cultural Change, 14(2)*, 174-189.

Robinson, J. (1952). The rate of interest and other essays. In *The Generalization of the General Theory.* (pp. 67-146). London: Macmillan.

Schumpeter, J. (1912). *The Theory of Economic Development.* Harvard University Press.

Schwert, W. G. (1990). Stock Returns and Real Activity: A Century of Evidence. *The Journal of Finance, XLV(4)*, 1237-1257.

Singh, A. (1997). Financial Liberalisation, Stockmarkets and Economic Development. *The Economic Journal, 107(442)*, 771-782.

Stiglitz, J. E., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review, 71(3)*, 393-410.

Yartey, C. A., & Adjasi, C. K. (2007). *Stock Market Development in Sub-Saharan Africa: Critical Issues and Challenges. (Workking Paper).* African Department: International Monetary Fund.

Zivengwa, T., Mashika, J., Bokosi, F. K., & Makova, T. (2011). Stock Market Development and Economic Growth in Zimbabwe. *International Journal of Economics and Finance, 3(5)*, 140-150.

Appendix

Appendix 1: Variance Decomposition Tables

Variance Decomposition of LGDP

Period	S.E	LGDP	DMKTCAP	DTRADED	DTURNOVER	DFDI	DHCI
1	1.301638	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.493749	76.89267	14.78449	3.718541	2.667240	1.580470	0.356595
3	1.546263	73.75243	16.23692	4.422132	2.500028	2.411669	0.676825
4	1.570482	72.00967	15.98339	5.188349	2.953867	2.408288	1.456430
5	1.587154	70.71018	16.23143	5.923189	3.322506	2.358092	1.454605
6	1.598352	69.87932	16.17713	6.228060	3.393561	2.819069	1.502863
7	1.604071	69.97472	16.06614	6.224700	3.413170	2.804537	1.516731
8	1.616791	69.01848	15.81608	6.635032	3.524642	3.351786	1.653984
9	1.621370	68.63111	15.79225	6.669069	3.540320	3.709839	1.657416
10	1.624293	68.43020	15.73569	6.710657	3.592223	3.821062	1.710170

Variance Decomposition of DMKTCAP

Period	S.E	LGDP	DMKTCAP	DTRADED	DTURNOVER	DFDI	DHCI
1	0.393556	1.084774	98.91523	0.000000	0.000000	0.000000	0.000000
2	0.462627	4.847009	75.48416	2.959013	2.034207	12.79048	1.885133
3	0.485522	8.302742	69.62119	3.881362	2.610180	13.82614	1.758388
4	0.506755	8.783644	64.89984	3.591801	2.401207	18.70938	1.614128
5	0.512532	8.845014	63.81970	4.752931	2.387899	18.58759	1.606864
6	0.515419	8.765461	63.80122	4.912526	2.362814	18.56780	1.590178
7	0.519963	10.00653	62.76028	4.833349	2.559517	18.27183	1.568494
8	0.522539	10.53731	62.15834	4.991499	2.534337	18.12314	1.655374
9	0.523598	10.60137	61.90722	5.139826	2.572942	18.11785	1.660788
10	0.524004	10.64411	61.81201	5.163981	2.578266	18.09629	1.705337

Variance Decomposition of DTRADED

Period	S.E	LGDP	DMKTCAP	DTRADED	DTURNOVER	DFDI	DHCI
1	0.490606	4.456772	75.95115	19.59208	0.000000	0.000000	0.000000
2	0.636464	4.806927	71.44797	17.80872	0.350220	1.764281	3.821880
3	0.737834	5.536546	53.38532	21.71017	0.713547	15.79562	2.858798
4	0.755788	5.384773	51.45612	21.12311	0.688081	18.60144	2.746468
5	0.800190	13.68221	45.92324	19.23491	0.975604	17.64488	2.539169
6	0.821714	14.98027	44.99297	18.24091	1.253324	18.11484	2.417681
7	0.837436	17.89998	43.35419	17.60061	1.266416	17.49052	2.388289
8	0.841591	17.90972	43.08975	17.58195	1.345105	17.68017	2.393308
9	0.843213	17.92870	42.92413	17.64193	1.345670	17.67629	2.483288
10	0.849676	17.82711	42.32833	17.80832	1.497975	18.01366	2.524601

Variance Decomposition of DTURNOVER

Period	S.E	LGDP	DMKTCAP	DTRADED	DTURNOVER	DFDI	DHCI
1	0.331599	3.044509	48.42224	44.75903	3.774219	0.000000	0.000000
2	0.376827	3.126377	44.77513	42.73985	3.608204	0.034239	5.716208
3	0.486037	10.18105	27.63559	41.76715	3.306785	13.42028	3.689146
4	0.503025	9.532591	25.82056	40.60744	3.139898	17.45213	3.447388
5	0.543693	20.68496	22.20551	34.79569	3.820795	15.20374	3.289307
6	0.565510	23.80639	21.54585	32.20412	4.099901	15.26040	3.083342
7	0.580233	27.03980	20.66453	30.80222	3.924161	14.50841	3.060889
8	0.583495	27.25494	20.57546	30.54923	3.931000	14.65870	3.030682
9	0.586400	27.32155	20.37352	30.53857	3.935956	14.70467	3.125736
10	0.591982	27.11980	20.07612	30.40535	4.036903	15.23823	3.123604

Variance Decomposition of DFDI

Period	S.E	LGDP	DMKTCAP	DTRADED	DTURNOVER	DFDI	DHCI
1	1.161889	12.99391	0.009641	3.203477	3.662169	80.13080	0.000000
2	1.583099	19.31116	4.608130	5.519692	3.474267	67.08111	0.005648
3	1.603784	19.58295	4.733869	5.520835	3.894878	65.79054	0.476920
4	1.695224	21.56682	6.059464	4.989767	4.783829	62.17211	0.428011
5	1.752625	24.47292	6.056664	5.616868	4.521783	58.22194	1.109833
6	1.807891	23.65211	6.143429	7.176530	4.758806	56.98838	1.280753
7	1.811718	23.68113	6.206723	7.155166	4.741477	56.75664	1.458862
8	1.856422	23.76535	6.077472	7.609342	5.092016	55.81774	1.638085
9	1.873226	24.06276	6.309640	7.532953	5.146555	55.29744	1.650650
10	1.882302	23.83165	6.255251	7.652353	5.226567	55.27294	1.761247

Variance Decomposition of DHCI

Period	S.E	LGDP	DMKTCAP	DTRADED	DTURNOVER	DFDI	DHCI
1	0.020606	17.47062	1.703225	30.33503	12.60385	16.61896	21.26831
2	0.023016	29.37325	2.579827	25.52913	11.41340	14.00199	17.10240
3	0.023672	31.05969	3.681802	24.51607	10.90560	13.25150	16.58533
4	0.024098	30.62597	4.725266	24.63169	10.97551	13.00049	16.04108
5	0.024449	30.07491	4.590985	24.71860	10.80492	14.11256	15.69802
6	0.024665	29.93534	4.510840	24.34180	10.67633	15.10862	15.42706
7	0.024722	29.93523	4.638248	24.23376	10.66490	15.05714	15.47072
8	0.024915	29.65154	4.782910	23.95592	10.65529	15.72111	15.23322
9	0.024973	29.83082	4.807502	23.88184	10.60854	15.66252	15.20878
10	0.025050	29.67276	4.818044	23.83986	10.62763	15.89200	15.14971

Appendix 2: Impulse Response Graphs

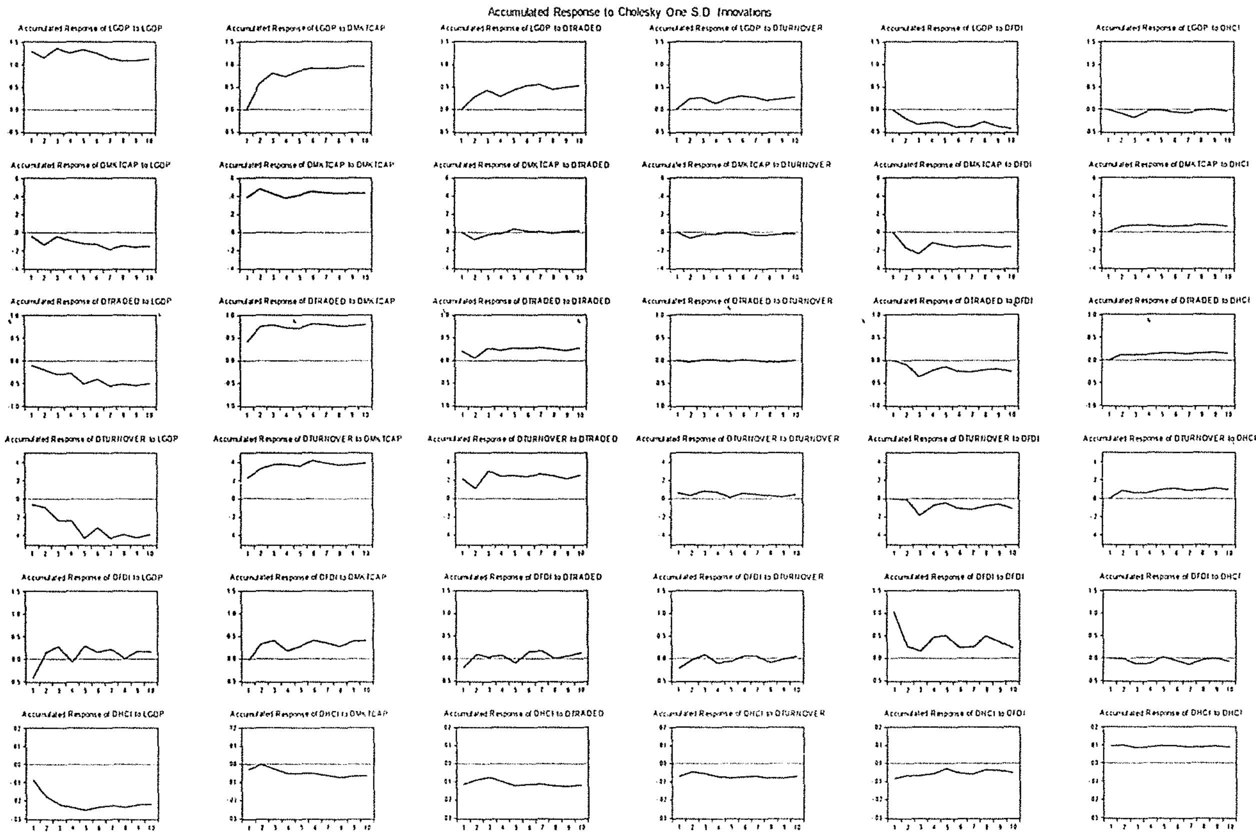

Figure 1: Impulse Response Functions