STOCK MARKET DEVELOPMENT AND ECONOMIC GROWTH IN AFRICAN FRONTIER MARKETS

NJOMO CHELSIE WAMBUI

078215

Submitted in partial fulfillment of the requirements for the Degree of Financial Economics at Strathmore University

Strathmore Institute of Mathematical Sciences

Strathmore University

Nairobi, Kenya

November, 2016

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.

..…….....

…….....

…….....

This Research Project has been submitted for examination with my approval as the Supervisor.

..…….....

…….....

…….....

Strathmore Institute of Mathematical Sciences

Strathmore University

ABSTRACT

There are three perspectives that have been used to explain the relationship between financial development and economic growth: the finance-led growth hypothesis, the growth driven finance hypothesis and the bi-directional relationship. As such, the casual relationship between stock market development and economic growth is still the subject of debate in research. This paper aims to address this topic in the context of African frontier markets. The Granger Causality test is applied to determine the direction of causality between stock market development and economic growth in African frontier markets using annual data from 1993-2014. These markets include: South Africa, Nigeria, Kenya, Mauritius and Morocco. The regression model is estimated using a panel Vector Error Correction Model. The Im, Pesaran and Shin test is conducted to determine the stationarity of the data while the Johansen Fisher test is used to determine the presence of co-integration among the variables. Based on the findings, there exists a long-run causal relationship running from stock market development to economic growth in the African frontier markets. This implies that stock market development promotes economic growth in these countries.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 Background to the study

Economic growth refers to the increase in the productive capacity of an economy and is measured using the Gross Domestic Product. Gross Domestic Product is the quantity of goods and services produced in an economy within a year. The importance of economic growth is emphasized because it reduces poverty, unemployment and indicates the standards of living in a country.

Extensive research has been done on the relationship between financial development and economic growth. There is a positive and robust correlation between financial development and growth as shown by empirical evidence. However, the causality between the two variables is still debatable. There are three perspectives that have been used to explain the relationship between financial development and economic development. The finance-led growth hypothesis postulates that development of the financial sector drives the real sector of the economy through the mobilization of savings and efficient capital allocation. In contrast, growth driven finance suggests that high economic growth creates demand for certain financial instruments and the financial markets are an effective response to these demands and changes. The bi-directional causal relationship explains that financial markets develop as a result of economic growth which in turn feeds back as a stimulant to economic growth (Choong, 2010).

The role of financial development on economic growth was first advanced by Schumpeter. According to him, the services provided by financial intermediaries such as mobilizing savings, project evaluations, monitoring managers, risk management and facilitating transactions are important for economic development. Financial development affects the rates of future long-run growth, physical capital accumulation and improvements in the efficiency of capital allocation. This implies that finance does not only follow growth but is very important in leading economic growth (King & Levine, 1993).

Financial development generally refers to the improvement in the efficiency, quantity and quality of financial intermediaries and it contributes to economic growth through the banking sector and stock markets. Although banks and stock markets provide different

financial services, stock market liquidity and banking development promotes long-run growth, capital accumulation and productivity growth. Financial markets are classified into money markets and capital markets. Money markets facilitate the borrowing and lending of funds for a short period of time, usually less than one year while capital markets deal with long term loanable funds. Stock markets which form part of capital markets facilitate the mobilization of long term investment capital for the financing of companies. According to Howells, Soliman and Caporale (2004) banks only finance well-established, safe borrowers while stock markets have the ability to finance risky, productive and innovative projects. Financial markets that are solely composed of banks would fail to achieve efficient allocation of capital because of the asymmetric information that is associated with debt financing. The development of stock markets is therefore important to achieve full efficiency of capital allocation.

The efficiency of stock markets is vital for it to promote economic growth as it allows investors to diversify idiosyncratic risk, making investments in firms more attractive. Moreover, it helps to mitigate moral hazard problems consequently increasing productivity since the stock prices reflect all available information in the market. The stock market also contributes to the economy by providing rewards to innovators. This is because efficient stock markets reduce transaction costs associated with the change of ownership of the asset thereby opening the way for the emergence of an optimal capital structure ownership. Inefficiencies caused by illiquidity and high transaction costs may result in reduced participation of the public in capital markets (Bekaert & Harvey, 1997).

Stock market development promotes economic growth through its impact on the growth rate of savings and investments. However, some researchers suggest that development of the stock markets may have a negative impact on economic growth. For instance, Levine and Zervos (1998) state that high liquidity in the stock market and international market integration may induce a decline in the savings rate such that the overall growth slows down.

Arestis, Demetriades, and Luintel (2001) also agree that increased liquidity may influence growth negatively through three channels. First, high stock market liquidity increases the return on investments thereby reducing savings. The second channel is that stock markets

make it easier for dissatisfied investors to sell their assets which leads to disincentives to exert corporate control and failure in corporate governance results in reduced economic growth. Finally, high stock market liquidity reduces demand for precautionary savings as the uncertainty is reduced.

Choong (2010) states that it is only when the monetary authorities adopt liberalized investment and openness policies, improve the size and regulations of stock markets, that the stock markets will stimulate economic growth. It is important to understand the role of stock market development to ensure it does not have a negative impact on economic growth.

1.1.1 Overview of the stock markets

This study will focus on the frontier stock markets in Africa which include: South Africa, Nigeria, Kenya, Mauritius and Morocco. This classification is according to the Morgan Stanley Capital International (MSCI) which is a global stock market index. Frontier markets as defined by the MSCI typically includes low/middle income countries with relatively underdeveloped capital markets. These markets have a relatively low correlation with the developed and emerging markets hence provide diversification benefits to investors.

The Johannesburg Stock Exchange (JSE) is the largest exchange in Africa with a market capitalization of USD 1,072,253,836,741.00 as at May 2016.[1] It was formed in 1887 and later joined the World Federation of Exchanges in 1963. The Johannesburg Stock Exchange offers five financial markets namely the equities and bonds, financial, commodities and interest rate derivatives. It has 396 companies listed on the exchange.

The Nigerian Stock Exchange was established in 1960. The exchange offers a range of tradable securities including: equities, bonds, Exchange Traded Products (ETPs) and plans to commence trading in derivatives in 2016. It has 175 listed companies and a market capitalization of USD 83,421,195,394.20 as at May 2016.[2]

[1] http://www.african-exchanges.org/statistics/828
[2] http://www.african-exchanges.org/statistics/838

The Nairobi Securities Exchange was founded in 1954 as a voluntary association of stockbrokers registered under the Societies Act. The company was registered under the Companies Act in 1991 and trading shifted to the more open and transparent open outcry system. It is the second African Exchange, after Johannesburg Stock Exchange, to be a publicly listed company on its own exchange. It provides a platform for the trading of equities and bonds, but going forward, the exchange will avail new products such as ETFs, Financial and Commodity derivatives and Carbon credits. The NSE has 64 companies listed on it as at March 2016. It has an average market capitalization of USD 20 billion per annum.[3]

The Stock Exchange of Mauritius was incorporated in 1989. The exchange operates two markets: the Official Market and the Development and Enterprise Market. There are 51 listed companies on the Official Market and 43 companies on the Development and Enterprise market.[4] The exchange has a market capitalization of USD 6,666,646,305.00 as at May 2016.[5] It was the first exchange in Africa to move to a fully automated and electronic stock market infrastructure since June 2001.

The Casablanca Stock Exchange (CSE) is the principal stock exchange of Morocco. It was established in 1929. It has 75 listed companies and a market capitalization of USD 45,515,844,270.14 as of January 2016.[6]

[3] https://www.nse.co.ke/
[4] http://www.stockexchangeofmauritius.com/
[5] http://www.african-exchanges.org/statistics/836
[6] http://www.african-exchanges.org/statistics/856

1.2 Statement of the problem

The relationship between financial development and economic growth can be analyzed from three perspectives: growth driven finance, finance-led growth or a bi-directional causal relationship. However, a debate still exists on the causal relationship between financial development and economic growth.

In the recent years, studies on the importance of stock market development in promoting economic growth have been established. Levine and Zervos (1996) conclude that stock market development enhances long term growth by improving capital allocation, risk diversification, mobilization of savings and exerting corporate control. In contrast, Agbetsiafa (2004) examined the relationship between financial development and economic growth in Sub-Saharan Africa. In his findings, economic growth influenced financial development in Kenya and Ivory Coast.

According to Patrick (1966), the direction of causality between financial development and economic growth depends on the stage of development of a country. Developing economies generally have finance-led growth where provision of financial services is vital for economic growth while growth driven finance is typical in developed economies.

Therefore, this study intends to identify the causal relationship between stock market development and economic growth. A cross-country regression on the frontier stock markets in Africa is done to examine this causal relationship. The countries include: South Africa, Nigeria, Kenya, Mauritius, and Morocco.

1.3 Research objective

1. The overall objective of this study is to evaluate the causal relationship between stock market development and economic growth in African frontier stock markets.

1.4 Research question

1. What is the causal relationship between stock market development and economic growth in African frontier stock markets?

1.5 Significance of research

The empirical findings of this research will be beneficial to academicians as it will contribute to the existing debate on the causal relationship between stock market development and economic growth especially with regards to the frontier stock markets in Africa.

Moreover, in order to enhance the economy of a country, understanding the causal relationship between financial development especially stock market development and economic growth is important. Theoretical and empirical research has mainly focused on the importance of financial development-mainly banks on economic growth. However, stock markets also play an important role in contributing to the economic growth of a country by increasing efficiency in the allocation of capital to more productive investments.

It is necessary for government authorities and policy makers to promote the development of stock markets in order to enjoy favorable growth. Inefficiencies such as illiquidity, high transaction costs, high taxes and restrictions on foreign market participation should be mitigated in order to encourage stock market development. According to Patrick (1966), financial authorities should encourage the proper foundation and expansion of financial institutions which creates a conducive environment for the growth of both the real economy and financial system.

The results of this research will therefore provide a better understanding of the causal relationship between stock market development and economic growth. This will give

insight to the policy makers on whether promoting economic growth is more important in order to ensure stock market development or vice versa.

2 LITERATURE REVIEW

2.1 Introduction

The literature review is structured into the theoretical and empirical framework. The theoretical framework explains the channels through which financial development and stock market development affect economic growth. The subsequent section examines the empirical evidence carried out by various authors of the link between financial development, in particular stock market development, and economic growth. The literature gap is then identified to show the significance of this study.

2.2 Theoretical framework

Patrick (1966) advanced the theory that there are two perspectives on the causal relationship between financial development and economic development- the demand following and supply leading phenomena. The demand following phenomenon proposes that development of the financial system is as a result of economic development. As the economy grows, it creates additional demand for financial services which brings about a supply response through the growth of the financial system. The supply-leading phenomenon proposes that creation of financial institutions and supply of their related financial services in advance of their demand stimulates growth. However, this approach plays a more significant role in the early stages of the growth process.

Goldsmith as cited in (Greenwood & Jovanovic, 1990) argued that financial structure of a country accelerates economic growth and improves economic performance by facilitating the migration of funds to the best user. The factors that determine the volume of issues by financial and non-financial sectors of the economy were analyzed for both developed and underdeveloped countries and he concluded that there is a positive relationship between financial development and economic growth but the direction of causal mechanism is unknown.

McKinnon and Shaw as cited in (Balassa, 1989) proposed that financial liberalization which involves deregulating the financial markets and allowing the market forces to determine real interest rates enables interest rates to rise towards their competitive market equilibrium. This would lead to increased savings, capital accumulation and

improvements in the efficient allocation of resources. Financial intermediation would increase and subsequently enhance economic growth especially in developing countries.

Below is a discussion of channels through which financial development stimulates economic growth. The financial system promotes growth through capital allocation, risk diversification, mobilization of savings and exerting corporate control.

Allocation of capital

According to Bencivenga and Smith (1991) the extent of financial intermediation in any economy influences the real growth rate by preventing misallocation of invested capital due to liquidity risks. Banks reduce the liquid reserve holdings of the economy and also the liquidation of productive capital. By allowing risk averse savers to hold deposits rather than liquid unproductive assets, banks reduce the need for self-financing of investments and these deposits are subsequently used to invest in productive assets.

Liquid stock markets also improve the allocation of capital by providing an avenue where savers can quickly and inexpensively sell their assets since they do not like to relinquish the control of their savings for long periods of time. This enhances long-term economic growth (Zervos & Levine, 1996). Howells, Soliman and Caporale (2004) agree that stock markets provide an avenue for investors with liquidity needs to sell their shares to those who do not suffer from liquidity shocks. This ensures that capital is not prematurely removed from firms to meet the short-term liquidity needs of investors. Stock markets, especially in developing economies, play an important role in allocating capital to the corporate sector since debt financing through bank loans may be a challenge. Booming stock markets also create liquidity therefore promoting economic growth.

The stock markets provide investors and entrepreneurs with an exit strategy which makes venture capitalist investments more attractive and may increase entrepreneurial activity in a country. Equity markets facilitate capital inflows-foreign direct investment and portfolio flows, which are important sources of finance for investment projects (Rousseau & Wachtel, 2000). Therefore, financial intermediaries play a central role in improving efficiency of investments through efficient allocation of capital rather than the volume.

The impact of financial development on growth varies according to time periods, regions and level of income (Gregorio & Guidotti, 1995).

Risk diversification

Financial intermediaries increase the productivity of capital by facilitating risk sharing of idiosyncratic shocks among investors, hence affecting their investment decisions. Banks pool the liquidity risks of depositors and invest these funds in more productive, illiquid projects. Consumers' liquidity risk can also be shared through the stock market by selling shares rather than withdrawing from banks. Stock markets reduce rate of return risk through portfolio diversification (Pagano, 1993). In addition to this, Atje and Jovanovic (1993) agree that the rate of return on an investment is higher in a financially developed economy because investors are insured against diversifiable risk which allows them to shift their portfolios towards higher return investments.

Levine and Zervos (1996) suggest that stock market development may influence economic growth through risk diversification. Internationally integrated stock markets foster investment in high return projects by enabling diversification of risk across different countries.

According to Bekaert and Harvey (1997), many emerging markets are segmented which means that the investors are local residents. In a segmented market, the investors are exposed to systematic risks such as currency risks regardless of diversification across different stocks within the country. Therefore, investors would require a higher risk premium as compensation for the risk. In contrast, an integrated stock market would allow investors to diversify their investments across different countries which minimizes the exposure to risk. In such a case, the equity risk premium would be lower since the investor has a world diversified portfolio. Therefore, stock market development through integration into the world market promotes risk diversification and subsequently increases economic growth.

Mobilization of savings

Another channel through which financial development spurs economic growth is through the mobilization of savings. Financial development alters the savings rate through various factors such as household borrowing, risk sharing and interest rate effects. The effect of these factors might however be ambiguous. Capital market imperfections lower the growth rate by depressing savings because the interest paid to savers is usually below that which is prevalent under perfect capital markets. Therefore, financial development is important in increasing the savings rate. Capital markets also facilitate household borrowing by channeling funds from savers to dissavers in the form of consumer credit and mortgages. Households experience liquidity constraints if the loan supply is less than the demand and therefore they cannot dissave as much as they want to. This increases savings but it implies that financial development through liberalization of consumer credit and the mortgage market reduces economic growth (Pagano, 1993). Beck and Levine (2004) suggest that financial development through allocation of resources may lower the savings rate which slows down long-run growth.

Corporate control

Stock market development promotes economic growth by exerting corporate control. Good corporate governance in a country is important for economic growth and efficient stock markets help to mitigate the principal-agent problem by tying managers' compensation to the stock performance. This helps to align the interests of both the owners and managers (Zervos & Levine, 1996).

Provision of information

Bekaert and Harvey (1997) state the importance of the efficiency of capital markets in order to spur economic growth. Capital markets efficiency means that the assets should be correctly priced and information about the assets is readily available. Liquid stock markets therefore reveal important information about changes in the firm value as a result of the movements in the stock prices.

Liquid stock markets promote the acquisition of information about firms which makes it easier for investors with the information to trade at the prevailing prices before the prices

change. The ability to make profits based on information provides investors with the incentives to research and monitor firms thereby improving resource allocation and promoting growth (Zervos & Levine, 1996). Rousseau and Wachtel (2000) concur with the idea that stock markets provide important information that improves the efficiency of financial intermediation. Stock markets improve the flow of information from managers to owners for companies that are listed on the stock exchange. This facilitates a quick market evaluation of a company's performance and developments.

It can be seen that financial development spurs economic growth through the various channels. However, it should be noted that there are researchers who argue that the importance of financial development on economic growth is overemphasized. Some analysts view stock markets in developing countries as casinos that have little and potentially negative effects on economic growth (Demirguc-Kunt & Levine , 1996).

According to Singh (1997) financial liberalization and expansion of stock markets in developing countries hinders economic development. This is because the interaction of stock markets and currency markets during unfavorable economic shocks may aggravate macroeconomic instability and reduce long-run growth. Moreover, the volatility of the stock market pricing process in developing countries makes stock markets a poor guide to efficient allocation of capital. Stock markets in developing countries do not possess the infrastructure for well-functioning markets or adequate information gathering and dissemination that is necessary to ensure that capital is allocated to the most productive projects.

2.3 Empirical research

Researchers have empirically investigated the relationship between financial development and economic growth as a result of the numerous theoretical literature. Previous studies have analyzed this relationship by focusing on the impact of the banking sector on economic growth while others have analyzed the impact of stock markets on growth. The

joint effects of stock markets and the banking sector has also been used to analyze this relationship.

This section is structured according to the studies that have been carried out on the relationship between financial development and economic growth and stock market development and economic growth.

Empirical literature on financial development and economic growth

Gregorio and Guidotti (1995) used two data sets to investigate the relationship between financial development and economic growth. A cross-country regression was done for 98 countries during the period 1960-1985 and also a panel data regression for 12 Latin-American countries for the period 1950-1985. Using the ratio of bank credit to the private sector to GDP as the proxy for financial development, the results confirmed that financial development has a positive effect on real GDP per capita. This relationship was stronger in the middle and low income countries because in high income countries, financial development was influenced to a large extent by the non-bank sector. However, the findings for the second dataset revealed that there is negative correlation between financial development and economic growth for the Latin-American countries and this could be attributed to the financial liberalization that the countries experienced during the 1970s. This shows that lack of proper regulation may result in lower efficiency of investment even with increased financial intermediation and subsequently have a negative impact on growth.

Levine and Zervos (1998) using data on 47 developed countries over the period 1976-1993 investigated the relationship between stock market development and banking development on current and future rates of economic growth, capital accumulation, productivity improvements and savings rate. The measures of stock market liquidity, size, volatility and integration with world capital markets were used to investigate this relationship. The stock market development indicators included turnover ratio, value traded ratio, market capitalization ratio, volatility of stock returns and the degree of integration which was modelled using International Capital Asset Pricing Theory (ICAPM) and International Arbitrage Pricing Theory (IAPT). Bank credit to the private sector was used as the indicator of banking development. Besides examining the

relationship between the financial development indicators and output growth, productivity growth and capital stock growth were also considered. Their findings showed evidence of a robust and positive correlation for stock market liquidity and banking development with current and future rates of economic growth, capital accumulation and productivity growth. The other stock market indicators did not have a robust link with long-run growth, capital accumulation and productivity improvements. Their study concluded that there is a strong and positive link between financial development and economic growth.

Howells, Soliman, and Caporale (2004) argued that the previous studies on financial development and economic growth that omitted stock market development might have produced misleading results and therefore incorporated this variable in their model. An analysis was undertaken on 7 countries for the period 1977-1998. The stock market development measures were market capitalization and value traded ratio. For banking development, the ratio of bank deposit liabilities to nominal GDP and the ratio of bank credit to the private sector to nominal GDP were used as proxies. First, a bivariate causality test was performed between the financial development indicator-the banking sector proxy and economic growth. The results showed a weak support for the hypothesis that there is a causal link between financial development and growth. A trivariate causality test was also done by including the stock market development and the results improved drastically. Causality between financial development and economic growth was strong and evident in 5 countries. Stock market development was the measure that contributed significantly to these findings.

Beck and Levine (2004) also showed that stock markets and banks are important for economic growth but their effects are independent. However, it is difficult to identify their specific components that are closely associated with economic performance. A panel of 40 countries during the period 1976-1998 was used to analyze the relationship between banks, stock markets and economic growth. Data averaged over 5 years was used to focus on long-run relationships. By using averaged data and instrumental variables, the model controlled for simultaneity bias, unobserved country-specific effects and reverse causation. Stock market development was measured using indicators such as turnover ratio, market capitalization and value traded. Bank credit to the private sector was used to

measure banking development. The results were consistent with the theory that financial development has a significant impact on economic growth.

Agbetsiafa (2004) investigated the relationship between financial development and economic growth in Sub-Saharan Africa. The countries that were used in this study included: Ghana, Ivory Coast, Nigeria, Kenya, Senegal, South Africa, Zambia and Togo during the period 1963-2001. The ratio of money to income, ratio of banking deposit liabilities to income, ratio of domestic credit to income, the share of private sector credit in domestic credit and ratio of private sector credit to income were the measures used for financial development. The Granger causality tests indicated a unidirectional causal relationship between financial development and economic growth in most countries. Countries such as Ghana, Nigeria, Senegal, Togo, South Africa and Zambia were seen to have the supply-leading causal relationship between financial development and economic growth while Kenya and Ivory Coast exhibited the demand-following causal relationship.

Empirical literature on stock market development and economic growth

Levine and Zervos (1996) evaluated the relationship between stock market development and economic growth using data on 41 countries during the period 1976-1993. The sample period was split so that each country had two time periods with data averaged over each sub-period. When modelling the relationship between the two variables, they used the indexes of stock market development that combine information on size, integration and trading and also control for initial conditions and other factors that affect growth. The indicators that were used for stock market development were market capitalization ratio (total value of all listed shares divided by GDP), turnover ratio (total value of trades divided by market capitalization), value traded ratio (total value of trades divided by GDP) and the degree of international integration of national stock markets. The results produced a strong positive correlation between stock market development and long-run economic growth which is consistent with theoretical literature.

Bekaert and Harvey (1997) had a similar conclusion that there is a positive relationship between stock market development and economic growth. To evaluate this relationship,

correlations between stock market development indicators and growth in real GDP for 18 countries during the period 1986-1992 were computed. Six measures of stock market development were used and they included: number of stocks listed, total value traded, market capitalization, turnover ratio, total value traded divided by GDP and market capitalization divided by GDP. The countries were ranked according to the stock market development measures and economic growth in a descending order and the rank correlation computed.

Rousseau and Wachtel (2000) used a panel data set of annual observations for the period 1980-1995 for 47 countries. The size of the market measured by market capitalization and a combination of size and liquidity measured by the volume of trading was used to analyze the relationship between stock market development and economic growth. The measures of stock market activity were deflated with the index of local share prices for each country. The studies suggested that increase in the intensity of activity in the traditional intermediaries and market value of equity traded on organized stock exchanges have a strong impact on growth while the effect of stock market capitalization is weaker.

Zhou (2011) investigated the impact of stock market development on economic growth in the US, UK, Hong Kong, China and Japan during the period 1988-2008. Stock market capitalization was used as the proxy for stock market development. The empirical evidence confirmed that there is a strong positive relationship between stock market development and economic growth regardless of the country's stage of economic development and type of economic systems.

2.4 Literature gap

Numerous studies have been done on the relationship between financial development-stock market development and economic growth. The empirical evidence shows that there is a strong positive relationship between stock market development and economic growth. However, only a few studies have investigated the causal relationship between the two variables.

Seetanah, Sawkut and Sannasee (2010) focused on 27 developing countries over the period 1991-2007 and simultaneously examined the stock market development, banking sector development and economic growth in a unified framework. The African frontier markets (South Africa, Nigeria, Kenya, Morroco and Mauritius) were among the countries included in their studies. They also assessed the substitutability and complementarity element of the stock markets and banking sector. According to their findings, stock markets and banks complement each other. Their research failed to investigate the direction of causality between stock market development and economic growth.

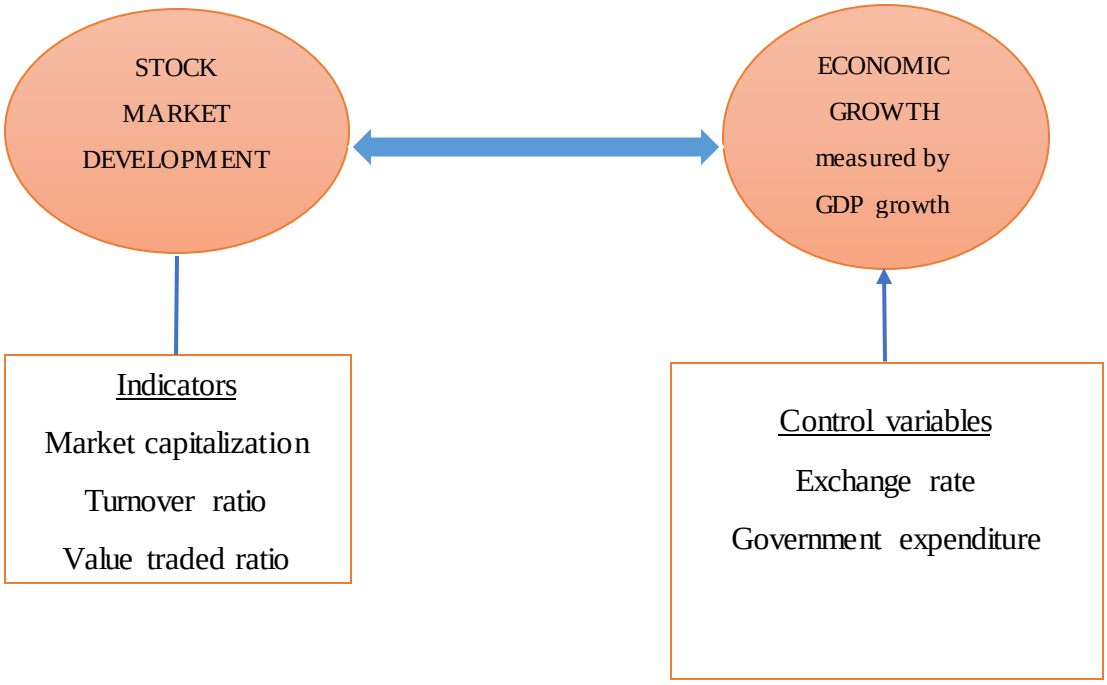
This paper will contribute to the existing literature by investigating the causal relationship between stock market development and economic growth in the African frontier markets. This is important as it will confirm whether these countries have a demand-following or supply-leading growth and can be of assistance to policy-makers in the relevant countries.

2.5 Conceptual framework

The diagram below explains the relationship between stock market development and economic growth. The aim of the study is to determine the casual relationship between stock market development and economic growth hence the arrow is bi-directional. In order to investigate this casual relationship, market capitalization ratio, turnover ratio and value traded ratio are used as the measures of stock market development. Gross Domestic Product growth is used as the measure of economic growth.

A set of control variables are included to control for other potential determinants of economic growth. The control variables used in this study are similar to those used by (Zervos & Levine, 1996) and they include: exchange rate and government expenditure. Exchange rate and government expenditure are used as control variables because evidence suggests a strong connection between macroeconomic policy and economic growth.

Figure 1: Conceptual framework



3 RESEARCH METHODOLOGY

3.1 Introduction

This section looks at the method that will be employed to investigate the relationship between stock market development and economic growth in the African frontier markets. It is structured into sections beginning with the research design which describes the nature of the research. The model specification is provided and the data collection and analysis techniques are explained.

3.2 Research design

This research applies a quantitative approach to examine the relationship between stock market development and economic growth in the African frontier stock markets. The research being conducted is explanatory research as it seeks to establish a causal relationship between stock market development and economic growth. The study will utilize annual panel data for the different countries covering the period 1993 to 2014.

3.3 Population and sampling

The study will cover the African frontier markets as classified by Morgan Stanley Capital International (MSCI). The countries include: South Africa, Nigeria, Kenya, Mauritius and Morocco. These countries are chosen due to the availability of data, particularly, the data on stock market development indicators. Therefore, some of the African frontier markets such as Egypt, Botswana and Tunisia are excluded due to lack of adequate data. The stock market development indicators will be obtained from the most active stock index for each respective country. This is because such an index is the most appropriate representative sample for the indicators of market size and liquidity.

3.4 Data collection

The data that will be used in this study is secondary because of the nature of the research. Stock market development indicators such as turnover ratio, market capitalization ratio, and value traded ratio will be obtained from the World Bank database. Government

consumption, GDP growth and foreign exchange rate will also be obtained from the World Bank database.

3.5 Model specification

In order to investigate the causal relationship between stock market development and economic growth, the following model specification is used:

$$(GDP_{it}) = \propto_0 + \propto_1 STOCK_{it} + \propto_2 FX_{it} + \propto_3 LN(GOVT_{it}) + \varepsilon_{it}$$

The subscript *i* refers to an individual country, and *t* refers to the time period.

GDP is the Gross Domestic Product growth and represents the measure of economic growth.

STOCK represents the index of stock market development.

α_0 is the coefficient that captures the intercept.

α_1 is the coefficient that captures the effect of the stock market development on economic growth.

α_2 and α_3 are the coefficients of the control variables foreign exchange rate and government consumption respectively.

ε is the error term.

To assess the independent link between stock market development and economic growth, a set of control variables are included to control for other potential determinants of economic growth in the regression. Levine and Zervos (1996) use initial income, initial education, a measure of political instability, the ratio of government consumption expenditure to GDP, inflation rate and the black market exchange premium as the control variables.

The set of control variables that will be used in this study include: foreign exchange rate and government consumption expenditure. Exchange rate and the government consumption expenditure are included in the regression because evidence suggests a strong connection between macroeconomic policy and economic growth.

In the context of this study, the indicators for stock market development are similar to those that have been used in previous studies, for instance (Bekaert & Harvey, 1997). The indicators include: market capitalization ratio (total value of all listed shares divided by GDP), turnover ratio (total value of trades divided by market capitalization) and value traded ratio (total value of trades divided by GDP).

3.6 Data analysis

A number of econometric issues might arise when dealing with panel data. Therefore, before testing the causal relationship between stock market development and economic growth, the following tests are carried out.

3.6.1 Unit root test

The unit root test is carried out to ascertain the stationarity of the data. This is important because one needs to establish the order of integration since variables can only be investigated if they have the same order of integration. Previous literature on panel unit root tests assumed that the individual time series in the panel were cross-sectionally independently distributed. However, it was clear that cross-sectionally demeaning the series before applying the panel unit root test could not work in general where pair-wise cross-section covariance of the error terms differed across the individual series (Pesaran, 2003).

Therefore, Pesaran (2003) framework is used to conduct a panel unit root test on the dependent and independent variables. In order to deal with the problem of cross-section dependence, the standard Dickey-Fuller (or Augmented Dickey-Fuller) regressions is augmented with the cross-section averages of lagged levels and first-differences of the individual series. The standard panel unit root test is then based on the simple averages of the individual cross-sectional augmented DF statistics (CADF) or suitable transformation of the associated rejection probabilities. The null hypothesis is that every time series in the panel is non-stationary.

Let y_{it} be the observation on the i^{th} cross section unit at time t and is generated according to the following simple dynamic linear heterogeneous panel model:

$$y_{it} = (1 - \emptyset_i)\mu_i + \emptyset_i y_{i,t-1} + \varepsilon_{it} \quad , i = 1,2,..N \; ; t = 1,2,..T$$

This equation can be written as:

$$\Delta y_{it} = \propto_i + \beta_i y_{i,t-1} + \gamma_i f_t + \varepsilon_{it}$$

The unit root hypothesis of interest, $\emptyset_i = 1$ is:

$$H_0 : \beta_i = 0 \; for \; all \; i$$

$$H_1 : \beta_i < 0 \quad , i = 1,2,..N_1, \beta_i = 0 \; , i = N_1 + 1, N_1 + 2 \ldots N$$

3.6.2 Cointegration test

Panel co-integration techniques are used to test for the presence of long-run relationships among the integrated variables with both a time series dimension and cross-sectional dimension. Using panel co-integration techniques ensures that the issue of simultaneity bias among the regressors is addressed (Christopoulos & Tsionas, 2004). The Johansen Fisher test for cointegration in panel data is used as it combines tests from individual cross-sections to obtain a test statistic for the full panel. This test aggregates the p-values of individual Johansen maximum likelihood co-integration test statistics.

If p_i denotes the p-value from an individual cointegration test for the cross-section i, then under the null hypothesis of no co-integration for the panel, we have the result:

$$2 \sum_{i=1}^{n} \log(p_i) \sim \chi^2_{2N}$$

3.6.3 Vector Error Correction Model

The Vector Error Correction Model (VECM) is applied in the presence of co-integration of the variables. Error correcting models allow for long-run components of variables to obey equilibrium constraints while short-run components have a flexible dynamic specification (Engle & Granger, 1987). According to Brooks (2008), if two I(1) series x and y are co-integrated, then there exists unique α_0 and α_1 such that $\mu_t = y_t - \alpha_0 + \alpha_1 x_t$ is I(0).

Therefore, the Vector Error Correction Model is of the form:

$$\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \lambda \mu_{t-1} + \varepsilon_t = \beta_0 + \beta_1 \Delta x_t + \lambda (y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \varepsilon_t$$

Provided that y_t and x_t are co-integrated with the co-integrating coefficient α, then all the terms are I(0). α_1 defines the long-run relationship between y and x. β_0 is a constant and β_1 describes the short-run relationship between changes in y_t and x_t. The coefficient λ describes the speed of adjustment back to equilibrium and it measures the proportion of last period's equilibrium error that is corrected for. The term μ_{t-1} represents the magnitude by which y is above or below its long-run equilibrium value in the previous period. ε_t represents the error term.

3.6.4 Vector Autoregressive Model

If co-integration is not established, then a Vector Autoregressive Model (VAR) is considered. The Vector Autoregressive Model is a tool for forecasting and is set up such that the current values of a set of variables are partly explained by past values of the involved variables. VAR models typically assume that the variables are endogenous. It is a natural framework for examining Granger causality and will be used to determine whether stock market development has an impact on economic growth or whether it is the reverse causation.

A general order-p Vector Autoregressive Model is of the form:

$$y_t = \beta_{y0} + \beta_{y1} y_{t-1} + \ldots \beta_{yp} y_{t-p} + \alpha_{x1} x_{t-1} + \ldots \alpha_{xp} x_{t-p} + \mu_t^y$$

This equation shows that the current value of y_t depends on the different combinations of the previous p values of both x and y and the error terms.

μ_t is a white noise disturbance term with $E(\mu_{it}) = 0 \ \ and \ E(\mu_{1t}\mu_{2t}) = 0$

An advantage that VAR models have over VECM is that they can be used when the co-integration structure is unknown. An important feature of the VAR model is the flexibility and the ease of generalization. The main limitation of both the Vector Error Correction Model and Vector Autoregressive Model is the determination of the appropriate lag and

how long the changes in the variables should take to work through the system since financial theory does not give any specification.

3.6.5 Granger causality test

Causality generally refers to the capacity of one variable to influence another. At times, there is difficulty in deciding the direction of causality between the two related variables and also whether or not feedback is occurring (Granger, 1969).

According to Granger (1988) if a pair of I(1) series are co-integrated, there must be causation in at least one direction. The Granger causality test seeks to determine whether past values of a variable helps to predict changes in another variable. A variable Y is Granger caused by a variable X if variable X better assists in predicting the value of variable Y. Therefore, according to the Granger causality, only past values of variable X can cause Y and that variables X and Y are only independent if both fail to Granger cause the other.

To assess the Granger causality, each variable is regressed against lagged values of itself and the other variable:

$$Y_t = \beta_0 + \sum_{j=1}^{J} \beta_j Y_{t-j} + \sum_{k=1}^{K} \Upsilon_k X_{t-k} + \mu_t$$

$$X_t = \beta_0 + \sum_{j=1}^{J} \beta_j X_{t-j} + \sum_{k=1}^{K} \Upsilon_k Y_{t-k} + \mu_t$$

The null hypothesis is that variable X does not Granger cause Y and variable Y does not Granger cause X. The choice of lags (J and K) is of importance because insufficient lags yield uncorrelated errors hence incorrect test statistics while too many lags reduce the power of the test.

The Granger causality test needs to take place in the context of a fully specified model because if the model is not correctly specified, spurious relationships may be found even when there is no actual relationship between the variables.

4 DATA ANALYSIS AND RESULTS

4.1 Introduction

This chapter presents the empirical findings of this study. The study employs a Vector Error Correction Model in determining the relationship between stock market development and economic growth. This is because co-integration is established between the variables. The following sections elaborate the results of the various econometrics tests.

4.2 Unit root tests

Each of the variables in the study was tested for stationarity using the Im, Pesaran and Shin panel unit root test. According to this test, the null hypothesis is that every time series in the panel is non-stationary. The results indicated that both the dependent and independent variables were non-stationary at first level at the five percent level of significance. This is because the p-values were greater than the five percent level of significance. All the variables were found to be I(1). The results were also confirmed by the Fisher-ADF, Fisher-PP and Levin, Lin and Chu panel unit root tests. The results of this analysis are shown in Appendix 1.

4.3 Cointegration test

The Johansen-Fisher panel cointegration test was carried out due to presence of non-stationarity in the variables. A cointegrating relationship is a long-term or equilibrium phenomenon since it is possible that co-integrating variables may deviate from their relationship in the short run but their relationship would return in the long run (Brooks, 2008). The results showed that the variables were co-integrated and the number of cointegrating equations was three. This implies that there is a long-run relationship between the dependent and independent variables.

Table 1: Johansen Cointegration Test Results

Johansen Fisher Panel Cointegration Test
Series: GDP_GROWTH STOCK_INDEX EXCHANGE_RATE GOVT_CONSUMPTION2
Date: 10/22/16 Time: 10:28
Sample: 1993 2014
Included observations: 110
Trend assumption: Linear deterministic trend (restricted)
Lags interval (in first differences): 1 4

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	285.9	0.0000	939.6	0.0000
At most 1	171.8	0.0000	132.5	0.0000
At most 2	49.53	0.0000	51.70	0.0000
At most 3	12.71	0.2402	12.71	0.2402

* Probabilities are computed using asymptotic Chi-square distribution.

The results of the Johansen Cointegration test as shown in figure 2 above uses both the trace statistic and maximum eigenvalue statistic. According to these statistics, there is cointegration between the variables as indicated by the low p-values (below the five percent level of significance). Therefore, the Vector Error Correction Model is employed to determine the relationship between stock market development and economic growth.

4.4 Vector Error Correction Model

The Vector Error Correction Model is carried out to determine whether there is a short run or long run relationship between the variables since cointegration has been established.

The results are presented below.

Table 2: VECM Results

Vector Error Correction Estimates
Date: 10/22/16 Time: 10:32
Sample (adjusted): 1998 2014
Included observations: 85 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
GDP_GROWTH(-1)	1.000000	0.000000	0.000000

STOCK_INDEX(-1)	0.000000	1.000000	0.000000	
EXCHANGE_RATE(-1)	0.000000	0.000000	1.000000	
GOVT_CONSUMPTION2(-1)	0.041502	-0.102056	-1.262697	
	(0.38389)	(0.09463)	(8.67566)	
	[0.10811]	[-1.07852]	[-0.14554]	
C	-5.400974	1.992636	-19.01454	

Error Correction:	D(GDP_GROWTH)	D(STOCK_INDEX)	D(EXCHANGE_RATE)	D(GOVT_CONSUMPTION2)
CointEq1	-0.567018	-0.000443	-0.699724	0.026056
	(0.28006)	(0.00736)	(0.66165)	(0.00960)
	[-2.02460]	[-0.06025]	[-1.05755]	[2.71419]
CointEq2	-0.780856	0.046344	-8.476789	0.122634
	(2.46490)	(0.06476)	(5.82327)	(0.08449)
	[-0.31679]	[0.71558]	[-1.45568]	[1.45147]
CointEq3	0.013382	-0.000419	-0.026932	0.001261
	(0.01715)	(0.00045)	(0.04052)	(0.00059)
	[0.78011]	[-0.93052]	[-0.66458]	[2.14535]
D(GDP_GROWTH(-1))	-0.182193	0.002882	0.775296	-0.022089
	(0.24604)	(0.00646)	(0.58127)	(0.00843)
	[-0.74050]	[0.44574]	[1.33380]	[-2.61920]
D(GDP_GROWTH(-2))	-0.220940	0.004013	0.284571	-0.017695
	(0.20840)	(0.00548)	(0.49233)	(0.00714)
	[-1.06019]	[0.73293]	[0.57801]	[-2.47719]
D(GDP_GROWTH(-3))	-0.124285	0.007483	0.057861	-0.003074
	(0.16685)	(0.00438)	(0.39418)	(0.00572)
	[-0.74488]	[1.70684]	[0.14679]	[-0.53756]
D(GDP_GROWTH(-4))	0.019191	0.004885	-0.209810	0.003084
	(0.10927)	(0.00287)	(0.25814)	(0.00375)
	[0.17563]	[1.70145]	[-0.81276]	[0.82348]
D(STOCK_INDEX(-1))	6.439104	-0.360975	7.538593	0.057303
	(5.14451)	(0.13517)	(12.1538)	(0.17634)
	[1.25165]	[-2.67056]	[0.62027]	[0.32496]
D(STOCK_INDEX(-2))	1.695926	-0.320745	13.39042	-0.258675
	(5.30799)	(0.13946)	(12.5400)	(0.18194)
	[0.31950]	[-2.29985]	[1.06782]	[-1.42174]
D(STOCK_INDEX(-3))	-0.932075	-0.060871	8.495090	-0.150392
	(5.14827)	(0.13527)	(12.1627)	(0.17647)
	[-0.18105]	[-0.45001]	[0.69846]	[-0.85223]
D(STOCK_INDEX(-4))	-1.461207	-0.276595	8.124603	0.021191
	(5.03427)	(0.13227)	(11.8933)	(0.17256)
	[-0.29025]	[-2.09111]	[0.68312]	[0.12280]

D(EXCHANGE_RATE(-1))	-0.031907	-0.001674	0.021031	0.007841
	(0.06948)	(0.00183)	(0.16413)	(0.00238)
	[-0.45926]	[-0.91705]	[0.12813]	[3.29248]
D(EXCHANGE_RATE(-2))	0.130794	0.002242	0.453213	-0.006994
	(0.07650)	(0.00201)	(0.18073)	(0.00262)
	[1.70976]	[1.11545]	[2.50773]	[-2.66727]
D(EXCHANGE_RATE(-3))	-0.149602	0.001090	-0.134878	-0.002418
	(0.07961)	(0.00209)	(0.18807)	(0.00273)
	[-1.87922]	[0.52094]	[-0.71716]	[-0.88615]
D(EXCHANGE_RATE(-4))	0.177262	-6.08E-05	0.077579	-0.001778
	(0.06684)	(0.00176)	(0.15792)	(0.00229)
	[2.65185]	[-0.03461]	[0.49125]	[-0.77580]
D(GOVT_CONSUMPTION 2(-1))	-12.03831	-0.057311	-11.13455	0.237627
	(4.52911)	(0.11900)	(10.6999)	(0.15525)
	[-2.65798]	[-0.48161]	[-1.04062]	[1.53065]
D(GOVT_CONSUMPTION 2(-2))	9.127199	0.151364	32.17896	-0.232063
	(4.62254)	(0.12145)	(10.9206)	(0.15845)
	[1.97450]	[1.24627]	[2.94662]	[-1.46460]
D(GOVT_CONSUMPTION 2(-3))	-7.752947	0.193047	-2.785828	-0.336776
	(4.51127)	(0.11853)	(10.6578)	(0.15463)
	[-1.71857]	[1.62868]	[-0.26139]	[-2.17790]
D(GOVT_CONSUMPTION 2(-4))	4.592037	0.020094	-1.473966	0.014090
	(2.76156)	(0.07256)	(6.52412)	(0.09466)
	[1.66284]	[0.27694]	[-0.22593]	[0.14885]
C	0.252728	-0.016343	-0.333979	0.115890
	(0.87560)	(0.02301)	(2.06857)	(0.03001)
	[0.28864]	[-0.71038]	[-0.16145]	[3.86132]
R-squared	0.596902	0.295713	0.250300	0.483382
Adj. R-squared	0.479074	0.089845	0.031157	0.332371
Sum sq. resids	865.8754	0.597744	4832.701	1.017338
S.E. equation	3.649817	0.095896	8.622601	0.125105
F-statistic	5.065852	1.436417	1.142176	3.200969
Log likelihood	-219.2561	90.07309	-292.3314	67.47235
Akaike AIC	5.629555	-1.648779	7.348975	-1.116996
Schwarz SC	6.204297	-1.074037	7.923716	-0.542255
Mean dependent	0.108558	0.007158	2.124061	0.080664
S.D. dependent	5.056882	0.100518	8.760150	0.153112

4.4.1 Long-run and Short-run relationship.

Table 3: VECM Coefficients

System: UNTITLED
Estimation Method: Least Squares
Date: 10/22/16 Time: 12:05
Sample: 1998 2014
Included observations: 85
Total system (balanced) observations 340

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.567018	0.280065	-2.024597	0.0439
C(2)	-0.780856	2.464902	-0.316790	0.7517
C(3)	0.013382	0.017154	0.780110	0.4360
C(4)	-0.182193	0.246042	-0.740497	0.4597
C(5)	-0.220940	0.208396	-1.060194	0.2900
C(6)	-0.124285	0.166851	-0.744882	0.4570
C(7)	0.019191	0.109268	0.175632	0.8607
C(8)	6.439104	5.144511	1.251646	0.2118
C(9)	1.695926	5.307991	0.319504	0.7496
C(10)	-0.932075	5.148271	-0.181046	0.8565
C(11)	-1.461207	5.034269	-0.290252	0.7719
C(12)	-0.031907	0.069475	-0.459255	0.6464
C(13)	0.130794	0.076499	1.709757	0.0885
C(14)	-0.149602	0.079608	-1.879220	0.0613
C(15)	0.177262	0.066845	2.651845	0.0085
C(16)	-12.03831	4.529113	-2.657985	0.0083
C(17)	9.127199	4.622544	1.974497	0.0494
C(18)	-7.752947	4.511266	-1.718574	0.0869
C(19)	4.592037	2.761562	1.662840	0.0975
C(20)	0.252728	0.875596	0.288636	0.7731
C(21)	-0.000443	0.007358	-0.060252	0.9520
C(22)	0.046344	0.064763	0.715584	0.4749
C(23)	-0.000419	0.000451	-0.930521	0.3530
C(24)	0.002882	0.006465	0.445744	0.6562
C(25)	0.004013	0.005475	0.732931	0.4643
C(26)	0.007483	0.004384	1.706841	0.0890
C(27)	0.004885	0.002871	1.701446	0.0901
C(28)	-0.360975	0.135168	-2.670561	0.0080
C(29)	-0.320745	0.139463	-2.299848	0.0222
C(30)	-0.060871	0.135267	-0.450005	0.6531
C(31)	-0.276595	0.132272	-2.091114	0.0375
C(32)	-0.001674	0.001825	-0.917050	0.3600
C(33)	0.002242	0.002010	1.115453	0.2657
C(34)	0.001090	0.002092	0.520936	0.6029
C(35)	-6.08E-05	0.001756	-0.034613	0.9724
C(36)	-0.057311	0.118999	-0.481606	0.6305
C(37)	0.151364	0.121454	1.246270	0.2138
C(38)	0.193047	0.118530	1.628677	0.1046
C(39)	0.020094	0.072558	0.276935	0.7820
C(40)	-0.016343	0.023006	-0.710382	0.4781
C(41)	-0.699724	0.661646	-1.057551	0.2912
C(42)	-8.476789	5.823269	-1.455675	0.1467
C(43)	-0.026932	0.040525	-0.664583	0.5069
C(44)	0.775296	0.581268	1.333801	0.1834

C(45)	0.284571	0.492331	0.578008	0.5638
C(46)	0.057861	0.394182	0.146787	0.8834
C(47)	-0.209810	0.258143	-0.812765	0.4171
C(48)	7.538593	12.15378	0.620267	0.5356
C(49)	13.39042	12.54000	1.067817	0.2866
C(50)	8.495090	12.16266	0.698456	0.4855
C(51)	8.124603	11.89334	0.683122	0.4951
C(52)	0.021031	0.164133	0.128132	0.8981
C(53)	0.453213	0.180726	2.507735	0.0128
C(54)	-0.134878	0.188073	-0.717156	0.4739
C(55)	0.077579	0.157919	0.491255	0.6237
C(56)	-11.13455	10.69992	-1.040620	0.2990
C(57)	32.17896	10.92065	2.946617	0.0035
C(58)	-2.785828	10.65775	-0.261390	0.7940
C(59)	-1.473966	6.524123	-0.225926	0.8214
C(60)	-0.333979	2.068575	-0.161454	0.8719
C(61)	0.026056	0.009600	2.714187	0.0071
C(62)	0.122634	0.084490	1.451470	0.1479
C(63)	0.001261	0.000588	2.145355	0.0329
C(64)	-0.022089	0.008434	-2.619199	0.0093
C(65)	-0.017695	0.007143	-2.477189	0.0139
C(66)	-0.003074	0.005719	-0.537561	0.5913
C(67)	0.003084	0.003745	0.823484	0.4110
C(68)	0.057303	0.176339	0.324959	0.7455
C(69)	-0.258675	0.181943	-1.421738	0.1563
C(70)	-0.150392	0.176468	-0.852234	0.3949
C(71)	0.021191	0.172561	0.122802	0.9024
C(72)	0.007841	0.002381	3.292481	0.0011
C(73)	-0.006994	0.002622	-2.667275	0.0081
C(74)	-0.002418	0.002729	-0.886150	0.3764
C(75)	-0.001778	0.002291	-0.775801	0.4386
C(76)	0.237627	0.155245	1.530654	0.1271
C(77)	-0.232063	0.158448	-1.464603	0.1442
C(78)	-0.336776	0.154633	-2.177897	0.0303
C(79)	0.014090	0.094659	0.148851	0.8818
C(80)	0.115890	0.030013	3.861318	0.0001

Determinant residual covariance	0.017431

Equation: D(GDP_GROWTH) = C(1)*(GDP_GROWTH(-1) + 0.0415015764268*GOVT_CONSUMPTION2(-1) - 5.40097445972) + C(2)*(STOCK_INDEX(-1) - 0.102055612897*GOVT_CONSUMPTION2(-1) + 1.99263601868) + C(3)*(EXCHANGE_RATE(-1) - 1.26269662325*GOVT_CONSUMPTION2(-1) - 19.014535132) + C(4) *D(GDP_GROWTH(-1)) + C(5)*D(GDP_GROWTH(-2)) + C(6) *D(GDP_GROWTH(-3)) + C(7)*D(GDP_GROWTH(-4)) + C(8) *D(STOCK_INDEX(-1)) + C(9)*D(STOCK_INDEX(-2)) + C(10) *D(STOCK_INDEX(-3)) + C(11)*D(STOCK_INDEX(-4)) + C(12) *D(EXCHANGE_RATE(-1)) + C(13)*D(EXCHANGE_RATE(-2)) + C(14) *D(EXCHANGE_RATE(-3)) + C(15)*D(EXCHANGE_RATE(-4)) + C(16) *D(GOVT_CONSUMPTION2(-1)) + C(17)*D(GOVT_CONSUMPTION2(-2)) + C(18)*D(GOVT_CONSUMPTION2(-3)) + C(19) *D(GOVT_CONSUMPTION2(-4)) + C(20)

Observations: 85

R-squared	0.596902	Mean dependent var	0.108558
Adjusted R-squared	0.479074	S.D. dependent var	5.056882

S.E. of regression	3.649817	Sum squared resid	865.8754
Durbin-Watson stat	2.185442		

The results of the Vector Error Correction Model estimation with four lags is presented in table 2 and 3 above. The number of lags chosen is in accordance with the lag selection criterion. The results in table 2 provide information about the three cointegrating equations. The cointegrating equations are represented by *CointEq1, CointEq2 and CointEq3*. Table 3 shows the results obtained after estimating the Vector Error Correction Model using an Ordinary Least Square regression with GDP growth as the dependent variable. It also shows the coefficients of the lagged variables and their significance. The joint significance of the lagged dependent and independent variables is determined by the Wald test.

The Error Correction Term represents the speed of adjustment back to equilibrium and it measures the proportion of last period's equilibrium error that is corrected for in the current period. The coefficient of the Error Correction Term, *C1*, is -0.567018 which implies that the speed of adjustment to long-run equilibrium is approximately 56.7018% annually. The sign of the Error Correction Term is negative and statistically significant at the five percent level of significance which confirms that there is a long-run causality from stock market development, exchange rate and government consumption to GDP growth.

The remaining coefficients, *C2-C80* represent the short-run relationship between the dependent variable GDP growth and the lags of the independent variables. Wald test is carried out in order to determine the significance of short run causality between the dependent and independent variables. The absence of short-run causality is established from the joint non-significance of the lags of each independent variable.

The results of the Wald test for each variable are presented below:

Table 4: Wald Test- Stock Index

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	2.004958	4	0.7348

Null Hypothesis: C(8)=C(9)=C(10)=C(11)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(8)	6.439104	5.144511
C(9)	1.695926	5.307991
C(10)	-0.932075	5.148271
C(11)	-1.461207	5.034269

Restrictions are linear in coefficients.

The p value is greater than the five percent level of significance. Therefore, we fail to reject the null hypothesis that the coefficients are insignificant. This implies that there is exists no short-run relationship between stock market development and economic growth.

Table 5: Wald Test- Exchange Rate

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	10.57981	4	0.0317

Null Hypothesis: C(12)=C(13)=C(14)=C(15)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(12)	-0.031907	0.069475
C(13)	0.130794	0.076499
C(14)	-0.149602	0.079608
C(15)	0.177262	0.066845

Restrictions are linear in coefficients.

There is a short-run causality from exchange rate to GDP growth as indicated by a p value less than the five percent level of significance.

Table 6: Wald Test- Govt. Consumption

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	12.52104	4	0.0139

Null Hypothesis: C(16)=C(17)=C(18)=C(19)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(16)	-12.03831	4.529113
C(17)	9.127199	4.622544
C(18)	-7.752947	4.511266
C(19)	4.592037	2.761562

Restrictions are linear in coefficients.

The p value is less than the five percent level of significance. Therefore, we reject the null hypothesis that the coefficients are insignificant. This implies that there exists a short-run relationship from government consumption to GDP growth.

4.5 VECM - Stock market development as the dependent variable

Since the direction of causality between stock market development and economic growth is not pre-determined, it is important to estimate the regression with stock market development as the dependent variable. The results are presented below:

Table 7: VECM Results 2

System: UNTITLED
Estimation Method: Least Squares
Date: 10/22/16 Time: 13:55
Sample: 1998 2014
Included observations: 85
Total system (balanced) observations 340

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.046344	0.064763	0.715584	0.4749
C(2)	-0.000443	0.007358	-0.060252	0.9520
C(3)	-0.000419	0.000451	-0.930521	0.3530
C(4)	-0.360975	0.135168	-2.670561	0.0080
C(5)	-0.320745	0.139463	-2.299848	0.0222
C(6)	-0.060871	0.135267	-0.450005	0.6531

C(7)	-0.276595	0.132272	-2.091114	0.0375
C(8)	0.002882	0.006465	0.445744	0.6562
C(9)	0.004013	0.005475	0.732931	0.4643
C(10)	0.007483	0.004384	1.706841	0.0890
C(11)	0.004885	0.002871	1.701446	0.0901
C(12)	-0.001674	0.001825	-0.917050	0.3600
C(13)	0.002242	0.002010	1.115453	0.2657
C(14)	0.001090	0.002092	0.520936	0.6029
C(15)	-6.08E-05	0.001756	-0.034613	0.9724
C(16)	-0.057311	0.118999	-0.481606	0.6305
C(17)	0.151364	0.121454	1.246270	0.2138
C(18)	0.193047	0.118530	1.628677	0.1046
C(19)	0.020094	0.072558	0.276935	0.7820
C(20)	-0.016343	0.023006	-0.710382	0.4781
C(21)	-0.780856	2.464902	-0.316790	0.7517
C(22)	-0.567018	0.280065	-2.024597	0.0439
C(23)	0.013382	0.017154	0.780110	0.4360
C(24)	6.439104	5.144511	1.251646	0.2118
C(25)	1.695926	5.307991	0.319504	0.7496
C(26)	-0.932075	5.148271	-0.181046	0.8565
C(27)	-1.461207	5.034269	-0.290252	0.7719
C(28)	-0.182193	0.246042	-0.740497	0.4597
C(29)	-0.220940	0.208396	-1.060194	0.2900
C(30)	-0.124285	0.166851	-0.744882	0.4570
C(31)	0.019191	0.109268	0.175632	0.8607
C(32)	-0.031907	0.069475	-0.459255	0.6464
C(33)	0.130794	0.076499	1.709757	0.0885
C(34)	-0.149602	0.079608	-1.879220	0.0613
C(35)	0.177262	0.066845	2.651845	0.0085
C(36)	-12.03831	4.529113	-2.657985	0.0083
C(37)	9.127199	4.622544	1.974497	0.0494
C(38)	-7.752947	4.511266	-1.718574	0.0869
C(39)	4.592037	2.761562	1.662840	0.0975
C(40)	0.252728	0.875596	0.288636	0.7731
C(41)	-8.476789	5.823269	-1.455675	0.1467
C(42)	-0.699724	0.661646	-1.057551	0.2912
C(43)	-0.026932	0.040525	-0.664583	0.5069
C(44)	7.538593	12.15378	0.620267	0.5356
C(45)	13.39042	12.54000	1.067817	0.2866
C(46)	8.495090	12.16266	0.698456	0.4855
C(47)	8.124603	11.89334	0.683122	0.4951
C(48)	0.775296	0.581268	1.333801	0.1834
C(49)	0.284571	0.492331	0.578008	0.5638
C(50)	0.057861	0.394182	0.146787	0.8834
C(51)	-0.209810	0.258143	-0.812765	0.4171
C(52)	0.021031	0.164133	0.128132	0.8981
C(53)	0.453213	0.180726	2.507735	0.0128
C(54)	-0.134878	0.188073	-0.717156	0.4739
C(55)	0.077579	0.157919	0.491255	0.6237
C(56)	-11.13455	10.69992	-1.040620	0.2990
C(57)	32.17896	10.92065	2.946617	0.0035
C(58)	-2.785828	10.65775	-0.261390	0.7940
C(59)	-1.473966	6.524123	-0.225926	0.8214
C(60)	-0.333979	2.068575	-0.161454	0.8719
C(61)	0.122634	0.084490	1.451470	0.1479
C(62)	0.026056	0.009600	2.714187	0.0071
C(63)	0.001261	0.000588	2.145355	0.0329

C(64)	0.057303	0.176339	0.324959	0.7455
C(65)	-0.258675	0.181943	-1.421738	0.1563
C(66)	-0.150392	0.176468	-0.852234	0.3949
C(67)	0.021191	0.172561	0.122802	0.9024
C(68)	-0.022089	0.008434	-2.619199	0.0093
C(69)	-0.017695	0.007143	-2.477189	0.0139
C(70)	-0.003074	0.005719	-0.537561	0.5913
C(71)	0.003084	0.003745	0.823484	0.4110
C(72)	0.007841	0.002381	3.292481	0.0011
C(73)	-0.006994	0.002622	-2.667275	0.0081
C(74)	-0.002418	0.002729	-0.886150	0.3764
C(75)	-0.001778	0.002291	-0.775801	0.4386
C(76)	0.237627	0.155245	1.530654	0.1271
C(77)	-0.232063	0.158448	-1.464603	0.1442
C(78)	-0.336776	0.154633	-2.177897	0.0303
C(79)	0.014090	0.094659	0.148851	0.8818
C(80)	0.115890	0.030013	3.861318	0.0001

Determinant residual covariance	0.017431

Equation: D(STOCK_INDEX) = C(1)*(STOCK_INDEX(-1) - 0.102055612897 *GOVT_CONSUMPTION2(-1) + 1.99263601868) + C(2)*(GDP_GROWTH(-1) + 0.0415015764268*GOVT_CONSUMPTION2(-1) - 5.40097445972) + C(3)*(EXCHANGE_RATE(-1) - 1.26269662325 *GOVT_CONSUMPTION2(-1) - 19.014535132) + C(4) *D(STOCK_INDEX(-1)) + C(5)*D(STOCK_INDEX(-2)) + C(6) *D(STOCK_INDEX(-3)) + C(7)*D(STOCK_INDEX(-4)) + C(8) *D(GDP_GROWTH(-1)) + C(9)*D(GDP_GROWTH(-2)) + C(10) *D(GDP_GROWTH(-3)) + C(11)*D(GDP_GROWTH(-4)) + C(12) *D(EXCHANGE_RATE(-1)) + C(13)*D(EXCHANGE_RATE(-2)) + C(14) *D(EXCHANGE_RATE(-3)) + C(15)*D(EXCHANGE_RATE(-4)) + C(16) *D(GOVT_CONSUMPTION2(-1)) + C(17)*D(GOVT_CONSUMPTION2(-2)) + C(18)*D(GOVT_CONSUMPTION2(-3)) + C(19) *D(GOVT_CONSUMPTION2(-4)) + C(20)

Observations: 85

R-squared	0.295713	Mean dependent var	0.007158
Adjusted R-squared	0.089845	S.D. dependent var	0.100518
S.E. of regression	0.095896	Sum squared resid	0.597744
Durbin-Watson stat	2.213651		

The coefficient of the Error Correction Term, *C1*, is 0.04634. However, it is positive and insignificant at the five percent level of significance which implies that there exists no long-run causality from GDP growth, exchange rate and government consumption to stock market development.

The short-run dynamics are captured through the individual coefficients of the difference terms. The significance of short-run causality between stock market development and the independent variables is determined by the Wald test. According to the results, there is no significant short-run causality between stock market development and the independent

variables. This is because the p-values are greater than the five percent level of significance, hence one can fail to reject the null hypothesis that the coefficients are insignificant. These results are presented in Appendix 2.

Therefore, one can conclude that stock market development promotes economic growth in the long-run in African frontier markets. However, there is no short-run causality between stock market development and economic growth. It is also evident that economic growth does not cause stock market development both in the long-run or short-run.

4.6 Granger causality test

The Granger Causality test is carried out to investigate whether there is a causal relationship between stock market development and economic growth in African frontier markets. Moreover, it is important to determine the direction of causality. Therefore, this test is conducted to confirm the above conclusion.

Table 8: Granger Causality Test Results

Pairwise Granger Causality Tests
Date: 10/23/16 Time: 15:38
Sample: 1993 2014
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
STOCK_INDEX does not Granger Cause GDP_GROWTH	105	2.84533	0.0947
GDP_GROWTH does not Granger Cause STOCK_INDEX		0.01636	0.8985
EXCHANGE_RATE does not Granger Cause GDP_GROWTH	105	13.6267	0.0004
GDP_GROWTH does not Granger Cause EXCHANGE_RATE		0.50745	0.4779
GOVT_CONSUMPTION2 does not Granger Cause GDP_GROWTH	105	0.17902	0.6731
GDP_GROWTH does not Granger Cause GOVT_CONSUMPTION2		2.00075	0.1603
EXCHANGE_RATE does not Granger Cause STOCK_INDEX	105	0.56954	0.4522
STOCK_INDEX does not Granger Cause EXCHANGE_RATE		0.67960	0.4116
GOVT_CONSUMPTION2 does not Granger Cause STOCK_INDEX	105	0.61697	0.4340
STOCK_INDEX does not Granger Cause GOVT_CONSUMPTION2		0.74248	0.3909
GOVT_CONSUMPTION2 does not Granger Cause EXCHANGE_RATE	105	0.00986	0.9211
EXCHANGE_RATE does not Granger Cause GOVT_CONSUMPTION2		5.60118	0.0198

Based on the Granger Causality test, it is evident that stock market development granger-causes economic growth at the ten percent level of significance. However, economic growth does not granger-cause stock market development. Therefore, there exists a unidirectional causality between stock market development and economic growth in African frontier markets.

4.7 Diagnostics checking

4.7.1 Goodness of fit

The R-squared is 59.62% and the F-statistic is significant as shown in Table 2. The F-statistic tests the null hypothesis that all of the coefficients except the intercept coefficient are zero. A significant F-statistic indicates that all the independent variables are able to explain the variations in the dependent variable. Therefore, one can conclude that the model is of good fit.

4.7.2 Serial correlation

According to the Portmanteau test of autocorrelation, there is no autocorrelation of the residuals. This is because the p-values are greater than the five percent level of significance, hence we fail to reject the null hypothesis of no autocorrelation. The results are shown below.

Table 9: Portmanteau Test Results

System Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Date: 10/23/16 Time: 18:44
Sample: 1998 2014
Included observations: 85

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	9.672987	0.8831	9.788142	0.8775	16
2	16.67841	0.9882	16.96237	0.9864	32
3	19.76977	0.9999	20.16683	0.9999	48
4	24.34118	1.0000	24.96398	1.0000	64

*The test is valid only for lags larger than the System lag order.
df is degrees of freedom for (approximate) chi-square distribution

5 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The aim of this study was to investigate the casual relationship between stock market development and economic growth in African frontier markets. The countries used in this study included: South Africa, Nigeria, Kenya, Mauritius and Morocco. Annual data was collected for the period 1993-2014. The study employed the Vector Error Correction Model in order to determine the long-run and short-run relationship.

The findings suggest that there is a long-run causal relationship running from stock market development to economic growth. However, in the short-run, there exists no causal relationship between stock market development and economic growth. The results also show that there is no causal relationship running from economic growth to stock market development both in the long-run and short-run. The Granger Causality test further confirms that stock market development granger-causes economic growth. The control variables used in this study also have a significant impact on economic growth as shown by the Wald test results. The control variables used include exchange rate and government consumption expenditure.

These findings concur with Patrick (1966) perspective that the stage of development of a country determines the direction of causality between financial development and economic growth. Therefore, African frontier markets exhibit a finance-led growth where provision of financial services is vital for economic growth. Moreover, the findings are consistent with those of Seetanah, Sawkut and Sannasee (2010) who conducted a study on similar African frontier markets. The results suggested that stock market development is an important ingredient of economic growth in developing countries, but with a lower magnitude as compared to banking development.

5.2 Conclusion

This study concludes that there exists a long-run relationship between stock market development and economic growth in African frontier markets. Moreover, it is a unidirectional causal relationship running from stock market development to economic growth. This study confirms the findings of previous researchers such as Levine and

Zervos (1996) that stock market development has a positive impact on economic growth. Therefore, it is consistent with existing theory.

5.3 Policy implications

The findings of this study has revealed that stock market development promotes economic growth in the long-run in African frontier markets. Stock markets play an important role in the mobilization of savings, allocation of capital, risk diversification and provision of information. Therefore, governments in the respective African countries should consider the following policy implications in order to spur economic growth.

Governments should encourage stock market development as measured by stock market size, activity and liquidity. African countries mainly have a bank-based financial system. According to Levine (2002), the bank-based view holds that bank-based systems, particularly at the early stages of economic development do a better job than a market-based financial system in mobilization of savings, allocation of capital, risk diversification and provision of information. Therefore, stock market development is important in these countries since banks and stock markets complement each other and offer different financial services.

In order to promote stock market development, African governments should implement favorable rules for listing of companies on the stock markets. This would increase the number of listed firms hence improving the stock market activity. Moreover, integration of the African stock markets with the world market is necessary as it enhances risk diversification. An integrated stock market would allow investors to diversify their investments across different countries which minimizes the exposure to risk. This would increase the number of foreign investors in the African markets as a result of increased confidence. Consequently, it would promote economic growth in the African countries.

5.4 Shortcomings and Areas of further research

One of the shortcomings of this study was limited data especially for the stock market development indicators. Annual data for market capitalization ratio, value traded ratio and turnover ratio was only available for a few years (1993-2014). In addition, not all the African frontier markets were included. Important countries such as Egypt, Botswana and Tunisia were excluded from this study due to lack of adequate data.

Further research can be carried out to determine the impact that stock market development has on economic growth since it has been established that there is a causal relationship running from stock market development to economic growth in African frontier markets. This study only investigated the causal relationship between stock market development and economic growth. However, it failed to quantify the effects that stock market development has on economic growth in African frontier markets. This is because the framework used i.e. the Vector Error Correction Model and Granger Causality test, is mainly for determining short-run and long-run causal relationships among variables.

The number of countries included in carrying out such research could also be increased in order to obtain more accurate and conclusive results on African frontier markets.

6 REFERENCES

Agbetsiafa, D. (2004). Finane Growth Nexus: Evidence from Sub-Saharan Africa. *Savings and Development*, 271-288.

Arestis, P., Demetriades, P., & Luintel, K. (2001). Financial Development and Economic Growth: The Role of Stock Markets. *Journal of Monrey, Credit and Banking*, 16-41.

Atje, R., & Jovanovic, B. (1993). Stock Markets and Development. *Eurpoean Economic Review*, 632-640.

Balassa, B. (1989). Financial Liberalization in Developing Countries. 1-31.

Beck, T., & Levine, R. (2004). Stock Markets, Banks and Growth: Panel Evidence. *Journal of Banking and Finance*, 423-442.

Bekaert, G., & Harvey, C. (1997). Capital Markets: An Engine for Economic Growth. *National Bureau of Economic Research*, 1-27.

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

Brooks, C. (2008). *Introductory Econometrics for Finance.* New York: Cambridge University Press.

Choong, C. K. (2010). Financial Development and Economic Growth in Malaysia: The Stock Market Perspective.

Christopoulos, D., & Tsionas, E. (2004). Financial Development and Economic Growth: Evidence from Panel Unit Root and Cointegration tests. *Journal of Development Economics* , 55-74.

Demirguc-Kunt, A., & Levine , R. (1996). Stock Markets, Corporate Finance and Economic Growth: An Overview. *The World Bank Economic Review*, 223-239.

Engle, R., & Granger, C. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 251-276.

Granger, C. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica*, 424-438.

Granger, C. (1988). Some Recent Developments in a Concept of Causality. *Journal of Econometrics*, 199-211.

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

Gregorio, J. D., & Guidotti, P. (1995). Financial Development and Economic Growth. *World Development*, 433-448.

Howells, P., Soliman, A., & Caporale, G. (2004). Stock Market Developmnt and Economic Growth: The Causal Linkage. *Journal of Economic Development*, 33-50.

King, R., & Levine, R. (1993). Finance and Growth: Schumpeter might be right. *The Quarterly Journal of Economics*, 717-737.

Levine, R. (2002). Bank-based or Market-based Financial Systems: Which is Better? *Journal of Financial Intermediation*, 1-36.

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

Pagano, M. (1993). Financial Markets and Growth. *European Economic Review*, 613-622.

Patrick, H. (1966). Financial Development and Economic Growth in Underdeveloped Countries. *Economic development and Cultural change*, 174-189.

Pesaran, M. (2003). A Simple Panel Unit Root Test in the Presence of Cross-section Dependence. 1-67.

Rousseau, P., & Wachtel, P. (2000). Equity Markets and Growth: Cross-country Evidence on Timing and Outcomes, 1980-1995. *Journal of Banking and Finance*, 1933-1957.

Seetanah, B., Sawkut, R., Sannasee, V., & Seetanah , B. (2010). Stock Market Development and Economic Growth in Developing Countries: Evidence from Panel VAR framework.

Singh, A. (1997). Financial Liberalisation, Stock Markets and Economic Development. *The Economic Journal*, 771-782.

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

Zhou, X. (2011). Development of Financial Market and Economic Growth: Review of Hong Kong, China, Japan, The United States and The United Kingdom. *International Journal of Economics and Finance*, 111-115.

7 APPENDICES

7.1 Results on Stationarity Tests

Panel unit root test: Summary
Series: STOCK_INDEX
Date: 10/18/16 Time: 11:46
Sample: 1993 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.80981	0.0352	5	105
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.15377	0.1243	5	105
ADF - Fisher Chi-square	12.6086	0.2464	5	105
PP - Fisher Chi-square	12.2897	0.2661	5	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: EXCHANGE_RATE
Date: 10/18/16 Time: 11:47
Sample: 1993 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.62060	0.0526	5	101
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.26325	0.3962	5	101
ADF - Fisher Chi-square	9.59915	0.4763	5	101
PP - Fisher Chi-square	8.30550	0.5990	5	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: GOVT_CONSUMPTION2
Date: 10/18/16 Time: 19:02
Sample: 1993 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.00934	0.5037	5	104
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.21435	0.9866	5	104
ADF - Fisher Chi-square	2.74986	0.9867	5	104
PP - Fisher Chi-square	2.27554	0.9938	5	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: GDP_GROWTH
Date: 10/22/16 Time: 10:19
Sample: 1993 2014
Exogenous variables: Individual effects
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.33050	0.9083	5	95
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.47173	0.0705	5	95
ADF - Fisher Chi-square	13.9083	0.1772	5	95
PP - Fisher Chi-square	188.319	0.0000	5	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

7.2 Results on Wald Tests

Table 10: Wald Test- GDP Growth

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	4.952108	4	0.2922

Null Hypothesis: C(8)=C(9)=C(10)=C(11)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(8)	0.002882	0.006465
C(9)	0.004013	0.005475
C(10)	0.007483	0.004384
C(11)	0.004885	0.002871

Restrictions are linear in coefficients.

Table 11: Wald Test- Exchange Rate

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	2.261322	4	0.6878

Null Hypothesis: C(12)=C(13)=C(14)=C(15)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(12)	-0.001674	0.001825
C(13)	0.002242	0.002010
C(14)	0.001090	0.002092
C(15)	-6.08E-05	0.001756

Restrictions are linear in coefficients.

Table 12: Wald Test- Govt. Consumption

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	5.839965	4	0.2114

Null Hypothesis: C(16)=C(17)=C(18)=C(19)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(16)	-0.057311	0.118999
C(17)	0.151364	0.121454
C(18)	0.193047	0.118530
C(19)	0.020094	0.072558

Restrictions are linear in coefficients.