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THE IMPACT OF CAPITAL MARKETS ON THE ECONOMIC GROWTH IN SOUTH AFRICA

by

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DECLARATION

I declare that "*THE IMPACT OF CAPITAL MARKETS ON THE ECONOMIC GROWTH IN SOUTH AFRICA*" is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full names.. Date..................................

Signed...

Signature.. Date..................................
Supervisor

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ABSTRACT

Capital markets, specifically as stock markets, are institutions that actively play a role in the development of an economy, an emerging economy and developed economy. This study investigates the impact of capital markets on economic growth in South Africa. To attain the set objective, cointegration and causality analyses was adopted, with an observation from 1971-2013. The results indicated that there is a positive relationship between economic growth and capital markets (where market capitalization and value of transactions were proxies for capital markets) and exchange rate as an additional variable. The R-squared was a substantial 0.50%, which suggests that only 50% of economic growth in South Africa is explained by the variables employed in the model for the period 1971-2013. The results further suggest that the country should focus on factors that contribute to the development of capital markets, such as the development of financial institutions. Moreover, although capital markets and economic growth have a positive relationship, it changes in the long run because it is a developing country. The study contributes to the existing lacuna on empirical literature with regards to economic growth and capital markets, especially with reference to stock markets as South Africa has one of the largest stock markets (JSE) in the world.

Keywords: **Capital Markets, Economic Growth and Exchange rates, Cointegration approach, South Africa**

JEL Classification:

GLOSSARY OF TERMS

Capital market : is defined as the market where medium and long term finance can be raised.

Economic growth : is the sustained increase in the economic activities of a county, this can in being the form of trade, finance and production as a whole

Market Capitalization : is the estimation of the value of a business that is obtained by multiplying the number of shares outstanding by the current price of a share.

Exchange rate : refers to the charge for exchanging the currency of one country for the currency of another.

LIST OF ACRONYMS

GDP	Gross Domestic Product
EXCHR	Exchange rate
MCAP	Market Capitalization
VLT	Value of shares traded
ADF	Augmented Dickey Fuller
PP	Phillips Perron
KPSS	Kwiatkwowski, Phillips, Schmidt and Shin
ODA	Official Development Assistances
VECM	Vector Correction Model
ECM	Error Correction Model
OLS	Ordinary Least Squares

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CHAPTER 1

INTRODUCTION

1.1 Introduction and background

Capital markets have over the years proven to be of high regard in South Africa. South Africa's unique level of growth forms part of the fastest developing countries in Africa. The country's gross domestic product (GDP) is largely accounted for by its stock market, which far exceeds that of other developing economies such as Mexico and Indonesia which also have economies that are growing quite well (Hassan, 2013). Stock markets have a substantial impact on growth and the case for South Africa is no different, from where it all began to date. According to De Kiewiet (1941) the greatest discovery and opportunity for development ever discovered was that of gold mines in South Africa. In the year 1887 large deposits of gold were unearthed in the Witwatersrand area. The discovery created a gap in the growing economy, making a potential opportunity a struggle with the lack of funds being the root cause of the challenges faced in those days. With that in mind, the establishment of the Johannesburg Stock Exchange (JSE) was the best sought after decision to try and curb the situation (Hassan, 2013).

Before the establishment of a proper automated system, a stock market was developed which was commonly known as "bourse". The challenge at the time was that it could only trade securities in small scales, which led to it closing down in the year 1996. A distinct approach was employed by Kock, (2009) who discovered that the JSE forms part of the largest stock markets in the world. The JSE ranks as the sixth largest as compared to its counters in developing countries globally which have South Korea as the largest, followed by Taiwan, India, Brazil and China being the fifth in terms of their stock markets. A highlight in the development of the South African stock markets took place when it had a surplus of 900 billion US dollars in the form of market capitalization, with above 400 firms listed in the stock market making it a developing country with the largest stock market in Africa (Kock, 2009).

The mining sector contributed immensely to the establishment of the stock market which further encouraged growth and helped with the improvement of the financial sector in South

Africa. South Africa relied mostly on the extraction of the precious metals for the enrichment of its economy as opposed to the traditional system of generating growth and development through agricultural processes. The mining sector also had a short-coming, because according to Trevor, Farrell and Cassim, (1999) it incurred a lot of expenses that required capital to be raised in order to maintain the blooming sector, in particular the deep-level gold mines. The growing market developed a path for a proper capital market to be put in place.

Alile, (1984) defines a stock market as an institution that actively plays a role in the development of an economy, an emerging economy and developed economy. The main function of the market is to link surplus funds to its counter deficit sector. The link is a form of resource mobilization and includes activities such as promoting reforms to modernize the financial sectors, and most importantly developing a channel for savings for various uses in the economy to enhance efficiency and growth in the economy (Alile, 1984). Capital markets allow emerging firms to be able to make loans that allow a contribution to productivity in the form of capital investment and growth which encourages job creation and growth in the economy Alile, (1997), Ekundayo, (2002) suggests that in order for a nation to be able to gain sustainable economic growth and development; it would require large volumes of investments both locally and internationally. The capital market makes the process possible in the financial and or monetary sector. Capital markets are drivers of any economy as argued by Osaze (2000), given that it is vital for long-term growth capital formation; they are also an important channel for savings and directing savings to profitable self-liquidating investment.

Adebiyi, (2005) is of the view that in everyday life, money is a vital tool used to satisfy a need or want in society whether it is worked for or sourced as a loan. The use of money promoted the growth of capital and the growth thereof boosts the economy. For the existence of capital markets, money is raised in various ways, which could be under the intervention of government as a regulator, the proper administration of service by various financial institutions or market operators. In every economy, the rate of growth is largely determined by its maturity in the financial market, particularly the capital market. Dominant financial markets enable nations from across the world to grow in terms of the economy and development by assisting them to generate much needed financial resources and skills needed to achieve their economic goals. Listed Equity stock or markets in third world countries suffered gravely in the early 1980s due to classical defects of bank dominated economies. The economies were short of capital equity, absence of liquidity, minimal foreign direct investors and a low confidence by investors with regards to the stock markets.

In the early 1990s, the rate of capital inflows to third world countries had increased rapidly as compared to that of Official Development Assistance (ODA) from the government in these respective countries (McLaughlin, 2003). The outcome of these large volumes of inflows counted as a positive effect on the development of these countries given that the use of ODAs (Official Development Assistances) was limited due to lack of funding and the vast responsibilities tied to the ODA. South Africa, as a sub- Saharan country, is an exception to the notion. This study further posits that countries that fall under this scope often find that there are more ODAs than there are private inflows, as a result the total private capital flows are on a smaller scale.

Furthermore, developing countries accumulate little to nothing in terms of domestic savings due to the large outflows in terms of ODAs that are used for the development of these sub-Saharan African countries. Capital outflows are the main reason behind the lack of domestic savings because of the volumes of local wealth (in the form of cattle, houses, land etc.) which cannot be measured in monetary terms by the formal sector. The need for development in these countries rises as there are impeding factors that contribute to the slow growth in development such as, the minimum levels of private foreign investment, low levels of domestic capital which has to cater for a high demand in ODA in the form of investments. In a general sense, capital markets are comprised of stocks, financial instruments(which are thought of as centralized institutions between a borrower or companies in need of capital loans and the lenders that give out these loans and exchanges (DeSoto, 2000).

A developed country, the US in particular, has taken groundwork steps that will look into how the financing mechanisms, their capital development programs and systems contribute to the growing developing countries and Applegarth, (2004) reviewed these various methods. The US also encourages growth in African countries and helps close the gap created by the short-comings in the inflow of investments. With a rise in this dire need for growth and savings in these sub-Saharan countries, it is also essential for a framework to be adopted in order to help promote growth in terms of domestic savings and investment. The growth of capital markets in these developing countries is difficult to measure since they are limited. A recommendation made by Applegarth, (2004) is that in order to get a scope of the levels of growth in these countries; an extra mile has to be taken.

Initiatives that are aimed at encouraging growth and investment in the sub-Saharan countries are growing in demand day by day. On the contrary, a factor that might delay the growth in these areas would be the lack of monitoring in terms of the capital markets in these developing areas. The market systems at hand would include, among others, banking systems, insurance and security schemes, pension fund schemes, and finance from Small Medium-sized Enterprises. A proper tool put in place to govern these financial resources would then contribute to a proper management system for current financial resources and those that are to be employed in future (Applegarth, 2004). With the limited literature on the empirical work that has been conducted in South Africa, it supports the notion that there is little effort put towards ensuring a proper working system is in place to keep track of the capital markets.

1.2 Statement of the problem

In sub-Saharan African countries like South Africa, there is little attention that is given to the role played by capital markets and its effect on economic growth in these countries. Given their third world nature, growth levels are slow. Macroeconomic objects fail to remain stable even after revised policies on these objectives and there appears to be a decline in capitalisation. Another matter arising in this regard is the failure of capital markets to perform efficiently. This growing concern creates a need for research to be conducted to evaluate the role played by capital markets in the development of the country and its economy. Furthermore, there is a need to evaluate the level of impact it has in growing the economy of South Africa.

Various authors have investigated the relationship between capital market development and economic growth in different countries such as Nieuwerburgh, et al., (2006) in Belgium, Hondroyiannis, et al., (2005) in Greece, Liu and Hsu (2006) in Taiwan, Korea and Japan. Ben Naceur and Ghazouani (2007) also conducted a study on the influence of stock markets and bank system development on economic growth using a sample of 11 Arab countries. Closer to South Africa, the relationship was investigated by Bolbol, et al., (2005) in Egypt and Adaramola and Kolapo (2012) in Nigeria. Enisan and Olufisayo (2008) also conducted a study on the stock market development and economic growth on seven sub-Sahara countries however, a focus on the case of South Africa is what this study seeks to establish. The researcher is not oblivious to the condition that it is relatively small in size and has a low liquidity level of their stock markets as well as its unpredictable quality of environment.

1.3 Research aim and objectives

The overall aim of this study is to determine the impact that capital markets have on the economic growth and development in South Africa from the year 1971-2013. The objectives of this study are:

- to determine the impact that Capital Markets have on the Economic Growth of South Africa and further employ techniques to measure the relationship;
- to gather results and propose recommendations.

1.4 Research questions

By meeting the aforementioned objectives, the study seeks to provide policy makers with the information they require to these important questions:

- what is the impact of capital markets on economic growth? Do capital markets promote short-run growth or long-term growth?
- Is there any causal relationship between capital markets and economic growth in South Africa?

1.5 Research hypothesis

The study hypothesises that causality exists between Capital markets and economic growth and that a relationship runs both ways;

Null hypothesis:

H_o: Capital markets have no impact on the economic growth of South Africa

Alternative:

H1: Capital markets have an impact on the economic growth of South Africa

1.6 Significance of the study

The research findings of this study will contribute to the decision made by policy-makers with a desire to grow the capital market sector and to develop the economy. The study itself is significant with regards to the capital market scope, as it will contribute to the growing body of knowledge around capital markets in developing countries such as South Africa. Information gathered in this study will also determine the role capital markets have on economic growth since the literature in this area of research is still minimal in South Africa.

1.7 Limitations of the study

There were minimal limitations in this study. The researcher adopted secondary data, which often poses as a limitation due to issues of time and relevance. Moreover, there was limited literature around this topic, specifically for South Africa. The researcher overcame these limitations by aid of similar studies conducted in the rest of the world as well as adopting the available data up to the year 2013. Furthermore, all else was accessible.

1.8 Research outline

This study is divided into five chapters and they are as follows;

Chapter one of the study is the introduction and background of the topic. It gives an overview of the foundation of Capital markets and Economic growth in South Africa. It gives information of where the studies began and the current state of the research. Following the introduction and background, are the research aims and objectives, its hypothesis, research questions,, the methodology of the study, its significance, short definitions, and finally the limitations of the study.

Chapter two is the literature review. In this chapter, an empirical and theoretical aspect of research is put together through various literatures around the topic. The chapter also outlines definitions of the two major variables and provides information that is relevant to the study. The methodology governs this part of the chapter given that the variables at hand determine the literature needed for the study to be well suited.

Chapter three of the study has three components or parts which are as follows; Research design, Data collection and analysis and lastly the instruments or tools used for the tests. To be able to test for causality, the study adopts the Engle Granger causality test, whereas to test for stationarity in terms of trends, the study adopts the Augmented Dickey Fuller (ADF), Phillips Perron unit root test (PP), Kwiatkwowski, Phillips, Schmidt and Shin unit root test (KPSS), Johansen Co-integration test, Vector Error Correction Mechanism and the General Impulse Response Function (GIRF).

Chapter four is the analysis of data and the interpretation of information and the concluding chapter. Chapter five contains the research findings and recommendations are suggested with regards to the outcome of the study.

1.9 Summary

There are many other aspects that have been high regard in South Africa and capital markets form part of the list. South Africa stands out as one of the fastest growing economies in the African continent. Moreover, a large portion of the country's GDP is accounted for by stock markets. Kock, (2009) discovered that the JSE forms part of the largest stock markets in the world. Dominant financial markets enable nations from across the world to grow in terms of the economy and development by assisting them to generate much needed financial resources and skills needed to achieve their economic goals. In any country, it is essential that initiatives that encourage growth and investments are promoted. On the contrary, a factor that might delay the growth in these areas would be the lack of monitoring in terms of the capital markets in these developing areas. These study further attempts to find the level of impact that capital markets have on economic growth through various econometric tools.

CHAPTER 2

THEORETICAL AND EMPIRICAL LITERATURE REVIEW

2.1 Introduction

This section introduces the literature review on the impact of capital markets on the economic growth of South Africa. The literature review is divided into two sections, namely theoretical literature and empirical literature. In the first section, the study reviews the theoretical literature for capital markets and economic growth. This section will review the impacts and effects or significance that these variables have on each other, which include theories that govern the variables and literature surrounding the topic in recent studies and present studies to date. In the second section, the study reviews the contributions made by existing scholars in the studies of capital markets and economic growth. This includes reviewing the empirical literature and findings with the aim to examine the causal relationship between the variables.

2.2 Concepts of Capital markets

There are various views that the Capital market is defined as the market where medium and long term finance can be raised (Akingbohungbe, 1996). In the capital market, there are risks associated with transactions made; capital markets offer financial instruments that enable economic stakeholders to exchange, pool and price risk. As the asset values increase, take for example in the form of capital acquisition and stocks, financial savings are enhanced. Al-Faki (2006) defines capital markets as a network of specialised financial institutions, series of mechanism, process and infrastructure that, in various ways facilitate the bringing together of suppliers and users of medium to long term capital for investment in economic development project.

2.3 Theoretical Review

In any country, economic growth is much sought after for the country to be able to grow and develop itself. There are various factors that help grow the economy and continue to be a key focus area for economists. A growing economy contributes to the development of the country's standard of living and also increases its per capita income. A well-developed financial sector improves the effectiveness of the capital market in any country as it becomes easier for the country to manage large volumes of capital and create a productive channel for operation. Moreover, a well-developed financial market would be vital, as growth theorists such as Harrod-Domar suggest that savings and investments are significant for growth to abound in any country. On the other hand, the Neo-Classical growth theory suggests that growth is derived from increasing factors of production; particularly labour and capital where there are only two sectors and two factors inputs. In the case of the Endogenous growth, theorists suggests that growth is best achieved when the role played by government through its policies encourage competition, such as the competition commission in South Africa which sparks up innovation in firms and keeps the market development cycle active (Ben, 1999).

2.3.1 The Harrod-Domar growth model

According to Harrod-Domar's growth model, savings and investment are a necessity for growth to take place. The growth of a country would depend on the level of Savings (S) and the productivity of capital investment which is also known as the capital-output ratio. Aghion and Howitt, (1998) emphasised that the principle is that a low capital output ratio automatically suggests that the output will be high with only a low capital input. On the contrary, a substantially high capital output ratio would produce a low level of output using a high level of capital input. The main concept behind capital output ratio is that when production employs large volumes of capital inputs, there is often little output from that production, whereas a low level of capital input employed produces a larger output.

A practical description of the calculation of the growth rate of GDP would be; Rate of growth of GDP = Savings ratio / capital output ratio. Therefore, growth can be achieved in two ways; either by increasing the national savings or by reducing the level of capital inputs. In the cases of developing countries, they are often abundant in labour but have little supply of capital in these developing countries that slow down growth. Ensuring that the financial markets in the country are well developed makes it easier for these developing countries to absorb capital intake and regenerate it into growth (Aghion and Howitt, 1998). An increasing growth rate helps the economy grow, which would create a demand for labour and the spending thereof would result in high rates of savings. Below is a figure of the Harod Domer Model.

Figure 2.1: The Harod Domer Model

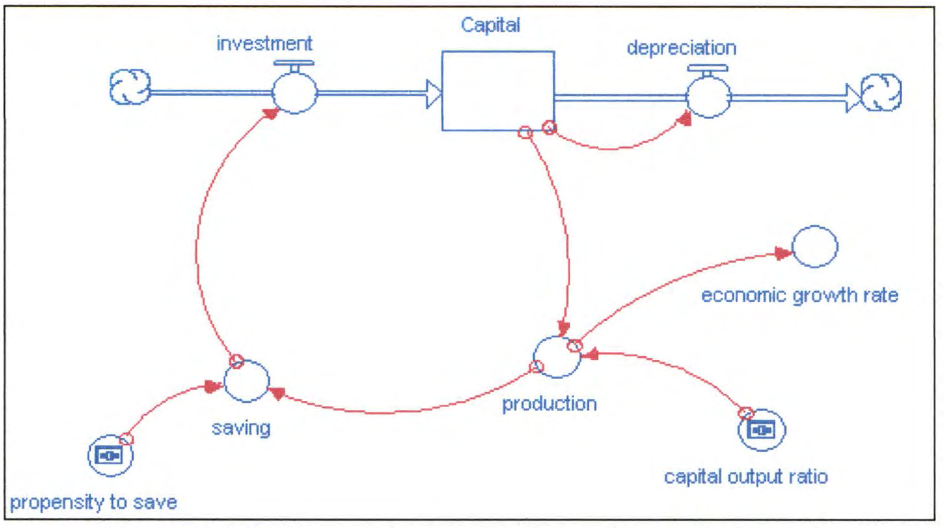


Figure 1: The Harrod-Domar Model of Economic Growth

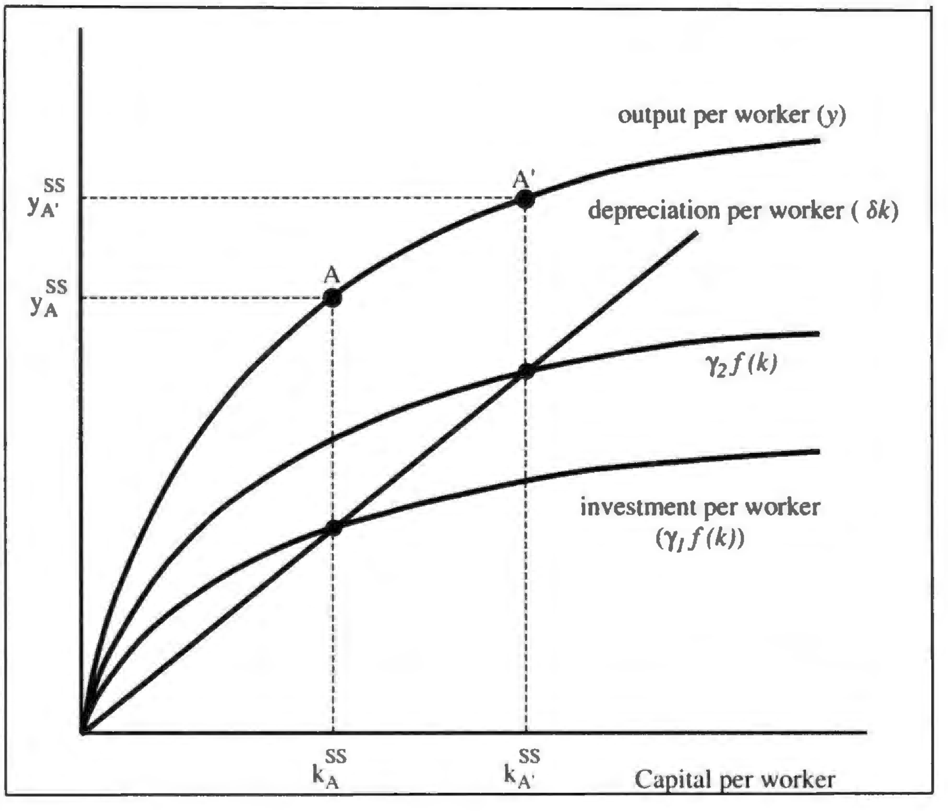
Source: http://www.iseesystems.com

2.3.2 Neo-Classical Growth – The Solow Model

The infamous Solow growth model was developed by the legendary economist Robert Solow (Solow, 1956). Unlike the Harrod-Domar where growth is determined by savings and investments, in the Neo-classical growth model growth is determined by increasing two factor inputs; capital and labour and innovations and technology. Although increasing capital investment can improve growth, the rate is short-term. The reason why the growth rate is short-term is because the proportion of capital to labour increases at the same pace. The marginal product of additional units of capital inputs might decline and given that the economy is at a short-term growth pace, it will return to a long-term growth path. This takes places where the economic growth of the country, the labour force and factor inputs all growing at the same rate. In case where capital, labour and growth are all increasing at a constant rate it is said to be a "steady state".

A distinction between neo-classical economists from all the other theorists is that they are convinced that growth only takes place when there is an increase in labour and capital. As a supporting statement, Swan, (1956) also stated that these economists often deem all other factors that contribute to the growth such as technology and new business perspectives, as less essential in comparison to labour and capital. Countries are factor abundant in various ways, the role of new technology and innovation becomes a key role player in finding ways to better utilise these resources. A developed country is more advanced in technology and their rates of growth are also relatively high. Furthermore, an increase in productivity due to new technology and business ideas is valued as external or endogenous variable(s). The increase is referred to as an external factor as its growth is independent on any capital input invested. Below is a figure of the Solow growth model.

Figure 2.2 Solow Growth Model



Source: http://oxrep.oxfordjournals.org

2.3.3 Endogenous Growth Theory

The endogenous growth theory was developed by the world renowned economist Adam Smith (Romer,1990). Capital accumulation on labour productivity marks the core of the endogenous growth theory. Adam Smith started a quest to justify his theory, firstly by suggesting that income in every nation should be regulated by two measures ; the manner in which labour is applied (be it in skill or judgement) and the ratio of the employed and the unemployed (which would give weight to the per capita income). As many marketers perceive growth to be stimulated by the demand or consumers, the Endogenous growth theory is a supply side driven theory. Adam Smith used the following formula to express the supply-side model.

$Y = f(L,K,T)$ 2.1

The above model represents the endogenous growth model, where L is labour, K is capital, T is land which are all independent variables and Y is the output which is the dependent variable. Labour, capital and land have a form of correlation with output, which is a suggestion made by Adam Smith. According to Adam Smith, growth (gY) was determined by population growth (gL) investment (gK) and land growth (gT) will eventually result in an improvement in the aggregate productivity (gf). An increasing workforce needs to be sustained in order for it to accommodate population growth, which suggests that population growth is endogenous as it depends on the workforce.

In a well-developed financial system or market the rate of savings are relatively very high, which would create opportunities for investment through these financial institutions and ultimately spiral out into growth. However, a country can only save from what it earns; therefore, their income distribution is a detrimental factor. In the endogenous growth theory, development in production creates a market for competition as the market widens, which drives the economy to demand an increased labour force and thus a need for capital investment (be it human or financial terms) is also born. Furthermore, a large contributor to the high rates of savings is the stock market (Romer, 1990). Given his view on factors that contribute to growth, Adam Smith seems to be aware of the fact that as the capital stock of a country increases, the profit declines, this is due to the fact that an increase in the stock will increase competition in the capital trading industry. A rise in trade competition will push the demand for higher wages, which will reduce profits as the proportion to share will escalate.

There are significant factors that inform the endogenous theory such as; Competition in the market is essential for growth in the economy which is a strategy that only government can implement through policies and other stimulus that encourage innovation, such as subsidies. Another key factor would be investment in skills or human capital. An equipped labour force is able to produce outputs that are satisfactory and of good quality. Training can also be in the form of entrepreneurship, which opens doors for labour, capital and land, which are also factors that endogenous economists deem as vital for growth to take place in any country. Hence, policies put in place by the government will ensure that innovation takes place and new frontiers will be attained by developing businesses. Below is a figure of the endogenous growth theory.

2.4 Theories governing Capital markets

The main role of capital markets is to ensure an efficient distribution of the country's capital stock. In its most simple term, an ideal market is where the activity in the economy is clear enough for all stakeholders to be able to make informed decisions. These informed decisions would be in the case where producers are able to decide when and how much to invest, given that the market at that time produces sufficient information that would suggest that these producers are making an informed decision at that time, it is basically an efficient market. There is however, a wide range of theory that constitutes capital markets. This study will discuss one capital market theory.

2.4.1 Capital market theory

According to Mapsofworld (2014) capital market theory is a generic term for the analysis of securities. Capital markets are mainly used to price assets which are regarded as shares. The Markowitz portfolio model is what builds up the capital markets theory. Capital market theory mainly stipulates that investors are efficient. They lend money at a risk free rate, the time frame or scope of all investors is the same, assets are very much divisible, there are no taxes and transaction costs and the expected outcome for the investors is the same.

2.5 Determinants of capital flows

For any country, to be able to develop a well-balanced policy, there is a need for investigating factors that influence capital flows or markets. Fernández-Arias and Montiel (1996) were the first to compile a list of reasons why large flows of capital in developing countries does more good than harm, that is until proper policies are put in place to try and curb the growing concern. According to the World Bank (1997), domestic factors are one of the crucial factors that influence capital flows in any country. In an observation made by the bank, it was discovered that many of the influences on the capital flows were not only external factors.

In an overall perspective, there are fundamentals that have a long-term impact on the rates of return to the investor. Fundamentals could be explained as having; high investment to gross domestic product ratio, low inflation and low real exchange-rate variability. Given the aforementioned, the following can be assumed;

- The World Bank, (1997) shed light with regards to development and the state of a country. They stated that developed countries or countries with high fundamentals have the potential of attracting large flows of GDP whereas developing countries or those with low fundamentals receive a relatively low flow of GDP and also fail to attract a constant flow of private investment.
- In emerging markets there are also various components that form part of the capital flows, of which foreign direct investment (FDI) is the largest. However, FDI is not explained by global interest rates although it is sensitive to the macroeconomic fundamentals, as compared to portfolio flows are sensitive to interest rates. In actual fact, researchers are convinced that interest rates are the key role players in the current state of capital flows (Calvo, Leiderman and Reinhart, 1996).
- Domestic opportunity and risk are reflected by country-specific factors. A favourable real economic growth rate may be viewed as a sign of a positive domestic environment and therefore reduces capital outflows. With the re-establishment of developing countries' creditworthiness, capital flows (which are formed by bonds and equity) are likely to be a major source of external finance. For example, FDI and portfolio investment are very large capital flows and are equity related (Goldstein, et al, 1991).

Over the years, developing countries have been receiving portfolio equity flows. In time, a change is expected due to countries' trade openness, with the main focus being on the domestic state rules that govern capital and income (Williamson, 1993). In light of Goldstein, et al, (1991) the appropriate dividends and capital may be the most crucial factor in encouraging significant foreign equity flows. According to classical literature in economics, the high risk assets are priced in such a way that they yield a higher return. Furthermore, as the international financial system adopts a diverse nature, in terms of integration and portfolios, asset prices are prone to change with the aim of restoring disequilibrium (Taylor and Sarno, 1997). This therefore, explains the exchange rate parity condition.

Bekaert (1995) states that major industrial and developing countries show a large and high increase in the interest rate differentials, which suggests that there is also an increase in the capital mobility in theses developing countries. Rates of return are often found to be higher in developing countries and countries that have a weak financial system as compared to many other markets in other countries that have an industrialised economy, the rate of return generally has a risk of volatility occurring associated to it. In a small economy, the output is anticipated to be higher with limited capital stock, given that there are diminishing returns on capital.

Another component of significance in the capital flows, as looked into by Bekaert (1995), is the rates of credit granted to countries and the secondary-market prices of sovereign debt, which often influence the investor confidence in that particular country. The valuing of the exchange rate is also a contributing factor to capital flight. The more overvalued an exchange rate is, the more likely it is for the currency to depreciate in future. The volatility of the exchange rate then propels residents to house their assets abroad to avoid any capital losses that might occur due to the volatility of the currency.

In terms of the relationship between government deficits and capital outflows, Hermes and Lensik, (1992), and Ajayi and Khan, (2000) suggest that the populace anticipate higher future taxes on the condition that government deficits are also on the rise, which also encourages capital outflows. However, the higher the debt rate, the more complex the future obligations become, which are the root causes of many historical debts. If a demand for a loan from other foreign countries does not suffice, then the population assume that the next best way for government to soothe the debt would be through inflation. The accumulation of debt by the government is then a valid explanation as to why capital flight is encouraged by capital flows.

The rise in the government debt further pushes residents to keep their assets secure abroad with the fear of an initiative that might be taken up by the government. In the case where the government decides to devalue the exchange rate with the aim of correcting domestic debt, the investment made by these residents will count as a loss. Taking all this into consideration, the capital markets abroad, could be doing far well off than the domestic capital markets given the uncertainty in the economy (Fry, 1991).

2.6 The stock market development

Harvey, (1995) and De Santis, (1993) stated that the growth and world wide scale of developing countries has improved positively over the years. In the year 1994, developing market's net capital worth was estimated at about \$1.9 trillion which showed an increase from the \$0.2 trillion net worth that was recorded in the year 1985. At the time, over \$39 billion was transferred into developing markets in the year 1994, as compared to the \$0.1

billion that was transferred in 1985. The growth in these markets raised eyebrows and caused focus on them by various scholars, researchers, practitioners and policy makers. A significant number of studies focus on assessing the privileges of holding an internationally broadened portfolio. In addition, more of those countries are trying to review their policies to try and encourage capital market development in their countries.

In the case of South Africa, during the mid-1990s, the relaxation of capital accounts and broader economic reform in South Africa encouraged improvement in the balance of payments. Shortly after democracy was introduced in 1994, the South African government introduced policies that were intended to regulate the foreign exchange market (FOREX) and international relations. The foreign debt crisis that was accumulated from historic debt of the previous government was a propelling factor to the resolution to start with the exchange controls (Leape, 1991). In late 1994, South Africa was already paving the way for re-entry into international bond markets after the sanctions. As a way to properly re-introduce the country into the market, sovereign credit ratings were established. The South African government has developed a system that keeps record of loans that are made abroad and attain a longer maturity profile for foreign currency debt and providing a scale for other South African borrowers to access international capital. The scale is perceived as a primary goal for external loans, given that a well-developed domestic bond market is an essential source of public sector financing.

2.7 Components that form Capital markets

Similar to the case of short term loans, loans that take a longer period can be granted in various ways. A majority of long-term loans in any economy are usually regulated by the public and private sector. In the cases where there are long-term loans that involve households, it is in the instance when households are granted mortgage loans for the purchasing of houses, with a maturity period of 20-25 years. A large portion of these loans are expected to be paid in a period of eight years. Furthermore, the significance of solid financial markets plays a role in the behaviour of firms and public sector. Below the four main components that form capital markets are discussed.

2.7.1 Bonds

Bonds are usually issued with a maturity period that is fixed while many others are issued with a maturity period of ten to twenty years (Howells and Bain, 2007). There are bonds that are issued by the public sector which are irredeemable, which is why a maturity period differentiates a bond. Therefore, bonds with a five year span are classed as "short-term bonds", bonds from a period of five to fifteen years are classed as "medium-term" and from fifteen onwards are classed as "long-term" bonds.

2.7.2 Equities

Equities which are also known as company shares are in actual fact supposed to be referred to as ordinary shares. Ordinary shares enable their bearers to gain access to future returns from the investment made, which are classed as company profit or dividends. By right, shareholders are the owners of the firm they have shares in. Ordinary shareholders shed a greater risk as compared to bondholders and preference shareholders, however the benefit of ordinary shares outweighs hat of bonds and preference shares (Howells and Bain, 2007).

2.7.3 The trading of bonds and equities

In capital markets, there are bonds and equities and there are ways in which these commodities are traded. The two main categories are the primary market, where shares or bonds are sold for the first time and the second category is when bonds and equities are sold as a second hand. Prices on the stock are set given the state of the market and the kinds of shares or bond that is on sale (Howells and Bain, 2007).

2.8 Capital market and Economic growth

The concept that financial development enhances economic growth was first made known by Schumpter in the year 1911 (Schumpter, 1912). The necessity was also emphasised by authors such as Goldsmith, (1969); Mckinnon, (1973) and Shaw, (1973) among others. There are views that commissioned the relationship between financial development and economic growth. Demand following argument is of the view that financial development is perceived as a stimulant for economic development which does not take into consideration the demand of financial services in a growing economy. The development in the real sector of the economy helps to smooth the growth in the financial sector. In contrast, the feedback hypothesis suggests that a bidirectional relationship between financial development and economic growth largely depends on the various stages of economic development.

A well developed and effective financial sector grows domestic savings and mobilises capital for productive projects that encourage economic growth. In the cases where there are inefficiencies in the financial sector, productive projects are often unexploited for developmental purposes. Capital markets act as a link between monetary and real sector and therefore smoothen the process of growth in the real sector and economic development. Although stock might impact growth in a positive manner, there are however factors that are key role players such as the size, liquidity and efficiency of the market as well as the quality of the environment. The quality of the environment is regarded as the social and economic conditions of the countries involved. In countries where there is high political instability and perceived risks, stock markets would be constrained (Agbetsiafa, D.K, 2003).

Al-Faki (2006) defines capital markets as "a network of specialised financial institutions, series of mechanisms, processes and infrastructure that in various ways, facilitate the bringing together of suppliers and users of medium to long term capital for investment in socio-economic development projects". A capital market is divided into sections, which is the primary and secondary market. In the primary market, opportunities are created by government that are intended to raise new funds through the insurance of securities which is bought by the general public or a particular group of investors. The Secondary market provides an avenue for the purchasing and selling of existing securities.

2.9 Why capital markets and financial sector development are important

Capital markets and financial sector development are important for three key reasons; they encourage economic growth, they support a country's strategic interests and they complements and strengthens existing bilateral and multilateral development initiatives. Capital markets are important because;

- Capital markets provide equity capital infrastructure developments that have strong-economic benefits that improve basic standards of living, by developing roads, water and sewer systems, housing, energy, telecommunications, public transport etc. The funding of these projects is sourced from long dated bonds and asset backed securities. Long- term sustainable growth and development can only be achieved if there is a strong infrastructural development. It increases the efficiency of the distribution of capital by ensuring that only initiatives that have the potential to generate profit are the ones that attract funds. The competitiveness of domestic industries is enhanced and it creates opportunities for these firms to compete globally. Once domestic markets increase production, the production spirals out into exports and the international markets is introduced giving birth to growth and development in the country (Akinboade, O (1998).

- Al-Awad and Nasri Harb (2005) also shared a view that capital markets create relationships between the private and public sector in the form of productive investments. The duty of transferring economic development from the public sector to the private sector is unavoidable as resources are becoming limited daily. Since the government is not self-sufficient, resources that they are unable to cater for are met by the private sector.
- Al-Awad and Nasri Harb further state that capital markets also attract foreign portfolio investors who are critical in supplementing the domestic savings levels. It facilitates inflows of foreign financial resources into the domestic economy. Recent empirical research linking capital market development and economic growth suggests that capital market enhances economic growth and development. Countries with well-developed capital markets experience higher economic growth than countries without. Evidence indicates that, while most capital markets in African countries are relatively underdeveloped, those countries which introduced reforms that are geared towards development of capital markets have been able to grow at relatively higher and sustainable rates (Al-Awad and Nasri Harb (2005).
- Capital markets increase the long-term savings (pensions, funeral covers, etc) that are channelled to long-term investment. The markets act as a mediator between micro saving individuals or households to macro lending individuals such as companies or medical aid schemes and the regular function of a proportion of the monetary flow in the form of insurance companies, collective investment schemes etc. It basically regulates the function of purchasing power in monetary terms and enables a flow from surplus sectors to deficit sectors with aim of gaining interest on returns (Beck, T., Levine, R., Loayza, N., (2000).

Capital markets also encourage firms to raise capital/ funds to finance their investment in real assets. An increase in assets promotes growth in the form of demand for labour, demand for goods and services and it further increases growth in production, which spirals out to growth in the economy and development. The existence of capital markets act as an aid to the banking system as well by linking long-term investments with long-term capital. It promotes growth and wealth distribution and provides opportunities for investment that encourage a culture in domestic savings and investment ratios that are important for rapid industrialization (Benhabib, J. And Spiegel, M.M., 2000).

2.10 Factors that influence capital markets

2.10.1 Income Levels

In a growing economy, the demand driven hypothesis states that as the income levels increase, the need for new financial services increase as well. Garcia and Liu, (1999) found that in a sample of Latin and Asian countries, income levels have a positive effect on stock market development. The modified Calderon – Rossel model used by Yartey, (2008) with a panel data of 42 developing markets for the period 1990 – 2004 discovered that income levels contribute to stock market development in developing markets. On the contrary, other researchers have a different perception. La Porta et al., (1996) have gathered that the effect of income levels is not direct rather higher volume of intervention through stock markets promote higher real income growth. The development in the stock market and its price index is stirred up by high income growth. Well-developed property rights, proper skills through education, an establishment of an effective business environment are all factors that have a positive effect on the stock markets. Other researchers however, such as Nacuer et al., (2007) found out that high income does not actually promote stock market development, looking at the data from Middle East and North Africa.

2.10.2 Macroeconomic stability

Inflation has over the years, upon various observations of study, been a tool used to try and maintain macroeconomic stability (Nacuer et al., 2007; Garcia and Liu, 1999). Stock market development has also shown traces of effects contributed to by macroeconomic stability, although there remains no trace of the form of effects. Take for example a study by Nacuer et al., (2007), who found out that macroeconomic stability has an important but negative relationship with sock market stock development. It appears that there is no correlation between stock market and inflation, as when inflation rises, the marginal impact on the stock market development diminishes at a quick decreasing rate. Researchers such as Garcian and Liu, (1999), conducted a study and observed a pooled data of 15 industrial and developing economies found no significant effect on the stock market by the macroeconomic stability. These researchers used change inflation, current and last year change in inflation, and standard deviation current and last year's 12 months inflation rate as the three main measures of macroeconomic stability.

Although there is no consensus with regards to the relationship between macroeconomic stability and stock market development, there is an argument that when the macroeconomic stability is at its highest, the investors are then encouraged to invest into the economy because the economic movement can be predicted. In addition, macroeconomic stability is a role player in a firm's profitability, which is why the price for securities is likely to increase. The greater the return on investment, the greater the chances of investors using these returns to further buy shares. This becomes a way of contributing to investors whose investments are experiencing a capital gain, they are more likely to channel their savings to the stock market by increasing their investments, and so this will enhance stock market development.

2.10.3 Banking sector development

Researchers seem to come to a dilemma when a decision has to be made with regards to the relationship between financial sector development and economic growth. Berthelemy and Varoudakis, (1996) and Christopoulos and Tsionas, (2004) state that banking sector development has a positive impact on economic growth, whereas Singh, (1997) has a different view and suggests that the banking sector might not be beneficial for economic growth. Another uncertainty is the relationship between banking sector development and the stock market. Although the view might not be clear, the banking sector is crucial for any economy and the development of its stock market. This is because it creates room for investors with liquidity through credit allowances and also spirals out a better channel for savings.

There are however, some researchers such as Nacuer et al., (2007) and Garcia and Liu (1999) found that there is in actual fact a relationship between the banking sector development and stock market development. Notwithstanding this, Yartey, (2008) shared the same view, although with a different perspective to it. Yartey stated that although the banking sector has a positive impact on economic growth, the existence of a high level of banking sector development might have a negative outcome in the long run because the bank and the stock markets would act as substitute for financial services. Undeniably, banks and stock markets can be viewed as competitors in providing financial services and a well-developed money market might cloud the capital market hence slowing the rate of development in the economy.

2.11 Empirical analysis

Contrary to the limited literature that has been conducted in South Africa, financial literature highlights the research that has been done on capital markets and economic growth and how it has been a focus area (King and Levine, 1993; Levine, 1997; Rajan and Zingales, 1998; Filler, Hanousek, and Campos, 1999; Arestis, et al., 2001; Calderon and Liu, 2002, Carlin and Mayer, 2003). A good measure of growth rate, capital accumulation and productivity in a country can be seen by the establishment of a proper financial intermediation as suggested by King and Levine (1993). In the same view, Carlin and Mayer, (2003) concluded that there is a positive relationship between a country's financial system and its growth rate.

In terms of causality between economic growth and financial markets, Garretsen, (2004) found the following: a 1% improvement of economic growth determines a 0.4% rise of market capitalization/GDP ratio. In their results, market capitalization/GDP ratio is not wide enough to represent a significant portion of economic growth. In addition, Beck, et al., (2006) also concluded that there is a positive correlation between capital market development and economic growth when measured using a dummy variable computed in order to represent market capitalization and whether it exceeds 13.5% of GDP. To better explain this phenomenon, Bose (2005) developed a financial model that explains the positive correlation between stock market development and economic growth which is solely based on the assumption that for levels of GDP per capita higher than a certain threshold the information costs become lower than bankruptcy costs, determining the development of capital markets.

Another case for concern is the financial liberalisation. Beckaert, et al., (2005) investigated financial liberalisation as a separate case of capital market development and discovered that equity market liberalisations, on average, were the stimulants of the 1% increase in annual real economic growth. Authors such as Claessens, et al., (2006), studied the relationship between domestic stock market development and internationalization using a panel data technique and suggest that domestic stock market development and stock market internationalization are positively influenced by the log of GDP per capita, the capital account liberalization, stock market liberalization and the country growth opportunities, whereas on the other hand are negatively influenced by the government deficit/GDP ratio.

A study conducted by Minier (2003) looked into the influence of the stock market dimension on economic development by employing three techniques; he discovered that the positive influence of stock market development on economic growth was only viable for developed stock markets in terms of their turnover, whereas in the cases of underdeveloped stock markets the influence is negative. Another study on the impact of financial structure on the economy during the period 1980-1995 by Ergungor, (2006), concluded that in countries with rigid judicial systems, the development of the bank-systems generates the strong impact on economic growth. On the contrary, countries with more elastic judicial systems have a greater influence because of the development of their capital markets.

Various authors have investigated the relationship between capital market development and economic growth in different countries. The long run relationship between stock market development (measured by market capitalization and number of listed shares) and economic growth was studied by Nieuwerburgh, et al., (2006) in Belgium. In their study, they adopted the Granger causality tests and highlighted that stock market development had a causal impact on economic growth in Belgium, with the focus period 1873-1935 not excluding the actual analysis period (1800-2000) with disparity taking place due to institutional changes that have an impact on the stock exchange.

In Greece, from the year 1986 – 1999, Hondroyiannis, et al., (2005) discovered that the link between capital market development and economic growth is bidirectional. There are several other factors that are key role players with regards to the impact of capital markets on economic growth in countries. Liu and Hsu (2006) focused on the effects of different components of financial systems on economic growth in Taiwan, Korea and Japan. They looked into the impact that a positive stock market development system (measured by market capitalization as percentage of GDP, turnover as percentage in GDP and stock return) has on economic growth. A study on the effect of financial markets (measured by the ratio of market capitalization on GDP and the turnover ratio) on aggregate factor productivity and growth (the per capita GDP growth rate) in Egypt (1974-2002) was conducted by Bolbol, et al., (2005). In their study, they showed a well-developed capital market had a positive impact on factor productivity and growth.

There are other authors however who are of a different view to the above set norm. Ben Naceur and Ghazouani (2007) conducted a study on the influence of stock markets and bank system development on economic growth using a sample of 11 Arab countries. They concluded that development of the financial system has a negative effect on economic growth, with an emphasis on countries with underdeveloped financial systems. They pointed out that there is a significant need of establishing a solid financial system in order to generate economic growth. Empirical studies that investigate the correlation between financial development and economic growth also show that, in terms of the direction of causality, as a general trend, financial development causes growth, where the causal relation is more significant in developing countries which can be explained by two channels; the growth of productivity and fast accumulation (Calderon and Liu (2002).

Rajan and Zingales (1998) stand in agreement with Calderon and Liu (2002). They highlight that financial development is a forecast for economic growth; given that value of potential economic growth opportunities are as a result of the present value of financial development. According to Levine (1997) and Levine and Zevros (1998), a good predictor of the GDP per capita growth and of the physical capital and productivity growth are capital market's liquidity. On the other hand, other indicators of capital markets are volatility, size and international integration which according to these authors do not give a significant explanation of economic growth. In the case of developed countries, Carlin and Mayer (2003) studied the link between financial systems and economic growth and also looked at various activities that have an impact on economic growth. A study on five developed countries was also done by Arestis, Demetriades and Luintel (2001). They adopted the autoregressive vector for an empirical analysis and discovered that capital markets do in fact have an effect on economic growth, however financial systems in terms of the banking sector has a greater impact on economic growth.

2.12 Conclusion

Although the literature shows room for adjustment with regards to this topic in South Africa, there is still room for one or two variables that can be included in the study. However, the literature reveals the significance of capital markets in South Africa and shows how a well-developed financial market ensures that capital markets reach their maximum potential. Literature also reveals that there are major macroeconomic variables that make it possible for capital markets to exist, such as economic growth. A growing economy, be it in capital and labour as inputs or in the rate of savings and investment in a country, one way or the other, a portion of growth has an impact on the effectiveness of capital markets. The study further pursues the impact of capital markets on economic growth in South Africa considering its conditions. Literature suggests that a more developed country has the potential to have a better financial market which entails a well off capital market. This study examines the impact on South Africa a country and contributes to the missing empirical literature.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, the research methodology will be discussed with the aim to further explain the findings of literature in an empirical manor. The chapter is divided into sections. In the first section the paper outlines the introduction to the chapter. This is followed by models that are used to perform the test. The third section of the chapter outlines the type of data used and where it is derived. The fourth section explains the model used, it gives a full detail on the model and any other information that make the tests possible with regard to the model used which is expressed in the form of model specification. Lastly in the fifth section there is a conclusion to the chapter.

The study aims at producing empirical evidence based on the impact and significance of capital markets on economic growth in South Africa. The prediction is that capital markets have an impact on economic growth in South Africa. The specification of the model used in this study was adopted from a model developed by Adaramola and Kolapo (2012). They investigated the impact of the Nigerian Capital Market on Economic Growth (1990 - 2010). Their model suggests that positive activity in the stock market acts as a stimulus for growth in Nigeria. Economic growth is proxied by Gross Domestic Production (GDP) while Capital market only caters for Value of Transactions and Market Capitalization.

3.2 Preliminary analysis

The primary purpose of this study is to explore the impact and significance of capital markets on economic growth. The first phase of the methodology is the data description which explains the data and the variables adopted in the study, how and where the data was collected for the purpose of reliability. The main purpose for conducting a preliminary analysis is so that the statistical tests give significant results.

3.3 Data Description

The study employed the annual time series data from 1971 to 2013. The data was collected in the following manor; Market Capitalization (MCAP) and Value of Transactions (VLT) were obtained from the Quantec data warehouse, Exchange rate (EXCHR) and Gross Domestic Product (GDP) was collected from the South African Reserve Bank (SARB). MCAP, VLT and GDP are collected in millions while EXCHR is in percentages.

The ultimate goal of this study is to recommend a way to improve the average standards of living for South African citizens through their income. The selected variables are firstly linked to the selected topic in the sense that there are various components that form capital markets for example, which are part of the model. As stated above, the model was adopted from a model developed by Adaramola and Kolapo, (2012), who included the following variables; market capitalization, (MCAP), total new issues (TNI), stock traded, total value of transactions (VLT), total listed equities and government stock and economic growth (GDP). This study selected only three of the respective variables and included an additional variable; exchange rate given that the rate of exchange has an impact on the stock traded in any country. In terms of the other two variables (TNI and LEGS) that were used, the researcher chose to exclude them as the data were not easy to access.

Below a data selection and design is expressed in a table format.

Table 3.3 Data selection and design

Variable	Short for	Transformation
Capital Markets (market capitalization)	MCAP	Logarithim ⇨ Log_mcap
Economic Growth (gross domestic product)	GDP	Logarithim ⇨ Log_gdp
Capital Markets (stock traded, value of gdp)	VLT	Logarithim ⇨ Log_vlt
Exchange rate	EXCHR	Logarithim ⇨ Log_exchr

3.3.1 Explanation of variables

Market Capitalisation (MCAP) is the estimation of the value of a business that is obtained by multiplying the number of shares outstanding by the current price of a share. During the years 1995-2005, there was a rapid growth in the two decades with regards to market capitalization in developing market countries. In the year 1995, the growth was at about $2 trillion and quickly grew to $ trillion in the year 2005. This extensive growth was also shared by Patrick, H, (1966) who reported that developing markets occupied 12% of the world market capitalisation and are slowly growing. Finally the value of transactions complements the market capitalization ratio by showing whether market size is matched by trading.

GDP is defined as the total market values of goods and services produced by workers and capital within a nation's borders during a given period (usually a year). In light of this particular variable, authors such as Levine and Zervos, (1998) have shown that stock market development has a positive impact on the economic growth, which is in the form of real economic growth. Levine and Zervos also highlighted that these opportunities for growth are not an exception for developing countries.

The value of transactions complements the market capitalisation ratio by showing whether market size is matched by trading. Unlike in developed countries where well-developed financial systems exists and are key, reports show that there is a negative contribution made by capital markets towards growth in developing countries (Nuhiu & Hoti, 2011 and Osinubi , 2001). The findings show that as development takes place, the negative impact increases concurrently. Developing countries are said to have high rates of volatility in the prices of securities, volatile macroeconomic environments, less regulated organized markets and market liquidity.

Exchange rate (EXCHR) refers to the charge for exchanging the currency of one country for the currency of another. It shows the amount or value of the local currency needed to obtain the unit of the foreign currency. Firms gain exposure to international competition through exchange rates, which is driven by their primary input and output prices. Joseph, (2002) put it in this manor, the volatility of the exchange rate has an influence on a value of a firm, given that the cash flow is largely determined by the fluctuations thereof. He further stated that as an appreciation of the currency occurs, exporters lose their gap in the international market in the form of competition, the stock prices will reduce as well as the sales and profits of the exporters. His view conclusively suggested that exchange rate volatility has an impact on more than just growth in a country, importers and exporters are also affected differently.

3.4 Econometric Models

The tests that were employed were as follows; Augmented Dickey-Fuller unit root test (ADF), Phillips Perron unit root test (PP), Kwiatkwowski, Phillips, Schmidt and Shin unit root test (KPSS), Johansen Co-integration test, Granger causality, Vector Error Correction Mechanism.

In economics, theory suggests that there is either a causal or co integration relationship between variables. The data employed in a model is what motivates theory (Asteriou & Hall; 2011). Various authors have a view of the empirical outcome of capital markets and growth. In the light of causality between economic growth and financial markets, Garretsen (2004) found that an improvement of economic growth determines a rise of market capitalization/GDP ratio. Correlation between capital market development and economic growth shows a positive result according to Beck, et al., (2006). Their study employed a dummy variable in order to represent market capitalization and whether it exceeds 13.5% of GDP. Engle and Granger, (1978) explain economic models as a tool that plays an integral part in its contribution to economic theory. Since theory is based on researched assumptions, models provide a reasonable ground to back the conclusion that theory derives from studies (Engle and Granger, 1978). A model assists in the arrangement of ideas of the matters at hand, separating the information to gather the direction of relation in either a causal or effectual way. In this study, the econometric model is as follows;

$$Y=f(x_1,x_2,x_3)\qquad(3.1)$$

where Y is economic growth or GDP = dependents variable, $(x_1, x_2 \; and \; x_3)$ are independent variables that affect Economic growth and *F* represents the functional notation or functional form.

Given the standard equation, it can be expressed as:

$$GDP=f(MCAP, VLT, EXCHR)\qquad(3.2)$$

Where; GDP = Gross Domestic Product (proxy for economic growth) MCAP = Market Capitalization, VLT = Total value for Transactions and EXCHR= Exchange rate

A detailed form of equation (1) will be as follows:

$$GDP = \beta_0 + \beta_1 MCAP + \beta_2 VLT + \beta_3 EXCHR + \mu \ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

In equation Bo represents the intercept or constant of relationship in the model whilstβ_1 , β_2 and $\beta_3$are coefficients of each of the independent variables. The μ is the stochastic or error terms. The linear representation of the equation will be in this manner:

$$Log(GDP) = \beta_0 + \beta_1 Log(MCAP) + \beta_2 Log(VLT) + \beta_3 Log(EXCHR) + \mu \ldots\ldots\ldots\ldots (3.4)$$

Where; Log = Natural log

From equation (4) a model can further be derived in a form of a time series as;

$$Log(GDP) = \beta_0 + \beta_1 Log(MCAP)_t + \beta_2 Log(VLT)_t + \beta_3 Log(EXCHR)_t + \mu \ldots\ldots\ldots (3.5)$$

$$Log(GDP) = \beta_0 + \beta_1 Log(MCAP)_{t-1} + \beta_2 Log(VLT)_{t-1} + \beta_3 Log(EXCHR)_{t-1} + \beta_0 + \sum (ECM)_{t-1}$$
$$+ \beta_0 + \sum_t \ldots\ldots\ldots\ldots (3.6)$$

In equation (5), the Error Correction Model appears. Since it appears, its model then is as follows:

where;

$$\sum_{i=0}^{n} (ECM)_{t-1} \ldots\ldots\ldots\ldots\ldots\ldots (3.7)$$

Error Correction term t-1 meaning the variables were lagged by one period ∑t White Noise Residual.

Equation (1) will be estimated by means of ordinary least squares (OLS) using annual data from the (SARB) South African Reserve Bank and the Quantec for the period 1971 through to 2013.

3.4.1 Unit Root Test

In econometrics, before an econometric model can be designed, there has to be a test of stationarity. The study first checks for the order of integration. In a broader term, Gujrati, (2003) states that a data series is stationary only if the mean and the variance are constant over time, moreover, the rate of the covariance between two time frames under study relies on the expanse in which the covariance is calculated. The Augmented Dickey Fuller (ADF), Phillips Perron, and the Kwiatkwowski, Phillips, Schmidt and Shin unit root tests are used to test whether the time series exhibits stationarity or not. Time series data usually exhibits non-stationarity at levels and has to be differenced to avoid the phenomenon of spurious results. This study adopts all three unit root tests.

3.4.1.1 The Augmented Dickey-Fuller (ADF)

A customised version of the Augmented Dickey-Fuller (ADF) was developed by Dickey and Fuller (1981). The ADF test corrects the original Dickey fuller test that did not cater for higher-order correlation by assuming that the series follows an Auto Regressive (p) process. Measures of control for higher-order correlation are implemented by adding lagged difference terms of the explanatory variables to the right hand side of the regression. ADF test is based on the estimation of the following regression;

$$\Delta Y_t = b_0 + \beta Y_{t-1} + \mu_1 \, \Delta\beta Y_{t-1} + \mu_2 \, \Delta\beta Y_{t-2} + \mu_3 \, \Delta\beta Y_{t-3} \ldots\ldots \mu_p \, \Delta\beta Y_{t-p} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots (3.8)$$

There are three main versions which can be used to test for the presence of unit roots;

1. Test for unit root;

$$\Delta y_t = \varphi^* \, y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-1} + \mu_t$$

2. Test for unit root with drift;

$$\Delta y_t = \beta_0 + \varphi^* \, y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-1} + \mu$$

3. Test for unit root with drift and deterministic time trend

$$\Delta y_t = \beta_0 + \varphi^* y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-1} + \beta_1 t + \mu$$

In order to conduct the ADF test, there is a need to specify if a constant or a constant and a linier trend should be included in the regression or in other cases neither. A way of achieving this would be through running a test which caters for both the constant and linier trend given that the other (constant and no trend) are a unique case of this general specification. Moreover, the inclusion of unnecessary regressors often leads to a reduction of the power of the test itself to be able to reject the null of the unit root. Furthermore, a possible solution proposed by Verbeek, (2004) was that a regression test can be conducted based on the graphical inspection of a series. The only time when the estimation equation will include a constant would be when the plot of the data does not begin from the origin. In the case where the plot of the data shows an upward or downward trend, then the trend should form part of the regression.

One other critical factor is determining the appropriate number of lagged difference term. If there are too few lags for instance, the null hypothesis might be over rejected when it is in actual fact true, whereas too many lag might lead to a reduction in the power of the test to reject the null. Lastly, Brooks, (2002) criticized the ADT test mainly because the power of the test is somewhat low in the case where the process adopted is close to nonstationarity, which suggests that the process is stationary but with the presence of a unit root close to the nonstationary boundary.

3.4.1.2 Phillips Perron (PP)

A collection of analysis has been made on the financial time series, of which Phillips and Perron (1988) developed a number of unit root tests. Although the ADF also tests for unit root, Phillips Perron slightly differs in terms of the heteroskedasticity in errors and the serial correlation. Phillips Perron uses a different approach to approximate the ARMA structure of errors in the test regression; it ignores any serial correlation as compared to the ADF that uses a parametric auto regression. On the other hand, the Dickey- Fuller test fits the following regression model;

$$\Delta y_t = p y_{t-1} + (\text{constant}, \text{time trend}) + \mu_t \text{ ....(3.9)}$$

The model adopts the ordinary least squares (OLS), however the presence of serial correlation might be a challenge. As an accountability measure, the ADF test's regression takes into account the lags of the first differences of y_t. The Phillips-Perron test involves fitting (1), and the results are used to estimate the test statistics. The estimate done by the PP test adopts the following model;

$$y_t = \pi y_{t-1} + (\text{constant}, \text{time trend}) + \mu_t \text{ ....(3.10)}$$

In equation (1), the $\mu_t$is integrated of order one [1 (1)], and there is a possibility that it may be heteroskedastic. In order to correct the existence of serial correlation or heteroskedasticity in the error terms, the PP test is applied non-parametrically when the Dickey-Fuller is modified. Basically, the PP test can be viewed as a Dickey-Fuller statistic test that has been made strong enough to cater for serial correlation by adopting the autocorrelation-consistent covariance matrix estimator and the Newey–West (1987) heteroskedasticity.

The test adopts the following model:

$$\Delta y_t = \beta^1 + D_t + \pi y_{t-1} + \mu_t \text{ ....(3.11)}$$

where; μ_t $is\ I(0)$ and may be heteroskedastic. The Phillips Perron test corrects any serial correlation and heteroskedasticity in the errors $\mu_t$of the test regression by directly modifying the test statistics $t_\pi = 0\ and\ t_{\hat{\pi}}$.

3.4.1.3 Kwiatkwowski, Phillips, Schmidt and Shin

In the year 1992, Kwiatkowski, Phillips, Schmidt and Shin (KPSS) introduced an alternative unit root test that has a null of stationarity of a series around the mean or a linier trend and the alternative stipulates that a series is non-stationary due to the existence of a unit root. On the contrary, the Dickey Fuller and the Phillips Perron assumes the presence of a unit root of which the KPSS poses a sense of innovation as compared to the former tests. A representation of a series in a KPSS model has the following components; stationary error term, the deterministic trend a random walk. The ADF has a minor limitation where the test itself has a lower power; the KPSS test on the other hand assumes that y_t is stationary at the null. The KPSS test is a Lagrange multiplier test. First and foremost, the test is computed by regressing the dependent variable y_t on a constant or a constant and a time trend t. Furthermore, save the OLS residuals ε_t and compute the partial sums $S_t = \sum_{s=1}^{t} \varepsilon_s$ for all t. Verbreek, (2004) produces a test statistic in the following manor;

$$KPSS\,LM = \sum_{t-1}^{t} \frac{S_t^{\,2}}{\sigma_t^{\,2}} \qquad (3.12)$$

where $S_t = \sum_{s=1}^{t} \varepsilon_s$ and $\sigma_t{}^2$ is the estimated error variance from the regression

$$y_t = \alpha + \varepsilon_t \; or \; y_t = \alpha + \beta_t + \varepsilon_t \qquad (3.13)$$

In order for the conclusion to be strong, the unit root and stationarity test are used co-jointly. The results produced can be compared to check for similarities and any variations that might occur. Ultimately, if the results are contradictory using both the ADF and the KPSS for instance, the KPSS test is opted for instead, given that presumptions are that the KPSS test caters for the drawbacks produced by the ADF test.

3.4.2 Johansen Cointegration test

It is well known that many macroeconomic variables contain stochastic trends Asteriou, & Hall, (2011). As data estimation is essential, it is primarily important that an existence of a spurious regression and cointegration should be considered. We experience a case of spurious regression when the sequence or series have a similar stochastic pattern even when they don't have anything in common. In probability theory, a stochastic system is one whose state is non-deterministic Asteriou, & Hall, (2011).The subsequent state of a stochastic system is determined both by the system's predictable actions and by a random element. The result of a spurious regression is said to be 'nonsense" in simple terms.

Hence, it is imperative that one makes sure all series in the data sets contain the same order of integration *I (1)* before proceeding to a cointegration test. Unit root tests have limited ability to distinguish the difference between a pure unit root and a close alternative; moreover the results are often based on subjective rather than theoretical and empirical facts. As a result, Cavanagh, Elliot, and Stock , (1995) suggest that there is a need for a tool, such as a near-integrated tool, that draws a distinction between the two, as small as it may appear to be. The

Johansen test builds cointegrated variables directly on maximum likelihood estimation instead of relying on OLS estimation. A key role player in this test is the relationship between the order of the matrix and its characteristic roots. The author of the model developed the maximum likelihood estimation by means of chronological tests for formulating the number of cointegrating vectors. This approach is considered as the secondary generation approach given that it does not solely rely on least squares, but is built directly on maximum likelihood.

The Johansen test adopts two different likelihood tests namely the trace test and the maximum eigen value test. A primary benefit of the Johansen test is that it can identify or estimate multiple cointegration relationships if the proposed data set contains two or more time series as compared to its counter being Engle-Granger and the Phillips-Ouliaris methods. Furthermore, the Johansen test is a vector cointegration test method. In an observation made, and it is discovered that the series is I (1), the result will not be an issue in terms of theory. Johansen (1995) suggest that even in the absence of a test that reveals the order of integration; a cointegration vector will best show the order of integration in the model. Hjalmarsson and Osterholm, (2007) denoted that the vector autoregression (VAR) extends the Johansen test of order *k* which is in the following manor;

$$y_t = \mu + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots + \beta_k y_{t-k} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots (3.14)$$

where y_t is an $N \times 1$ column vector of dependent variables which are integrated of order one. u_t denotes an $N \times 1$ column vector of innovations.

The VAR models are to be changed into vector error correction models (VECM) and will take the following form;

$$\Delta y_t = \pi y_{t-k} + \tau_1 \Delta y_{t-1} + \tau_2 \Delta y_{t-2} + \ldots \tau_k \Delta y_{t-k} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots (3.15)$$

Where; $\pi = \left(\sum_{i=1}^{k} \beta_i\right) - I_n \; and \; \tau_i = \left(\sum_{j=1}^{i} \beta_i\right) - I_n$ 3.3.4 Granger causality test

Granger causality is somewhat varied from causality. In the case where there are two points, A and B respectively, and there is causality from A to B, this result would suggest that there is direct causality from A to B. According to Brooks (2002) Granger causality is an econometrics tool based on the standard F-test framework to determine whether one time series is useful to predict the future of another series. For Granger causality, variable A would Granger-cause variable B if the previous adjustments of variable A can forecast the adjustments of variable B. Unidirectional causality takes place in an instance where variable A Granger-causes variable B. On the other hand, bi-directional causality takes place in the case where variable A causes variable B and where variable B also causes variable A.

There are two conditions that should be taken into account when conducting the Granger causality test whether or not the variable are cointegrated.

Where variables are not cointegrated, the VAR estimation equations are tested in the first difference in the following manor;

$$\Delta y_t = \sum_{j=1}^{n} b_j \Delta y_{t-j} + \sum_{j=1}^{n} c_j \Delta x_j + \mu_{t-1} \text{.................................} (3.16)$$

$$\Delta x_t = \sum_{j=1}^{n} b_j \Delta y_{t-j} + \sum_{j=1}^{n} c_j \Delta x_j + \mu_{t-1} \text{.................................} (3.17)$$

and in the case where the variables are cointegrated, the Error Correction Model (ECM) will be tested;

$$\Delta y_t = \sum_{j=1}^{n} b_j \Delta x_{t-j} + \sum_{j=1}^{n} c_j \Delta y_{t-j} + \varphi e_{t-1} + w_t \text{......................................} (3.18)$$

$$\Delta x_t = \sum_{j=1}^{n} b_j \Delta y_{t-j} + \sum_{j=1}^{n} c_j \Delta y_{t-j} + \varphi e^{*}_{t-1} + w_t^{*} \text{.................................} (3.19)$$

The Error Correction Model is used to test for causality amongst variables solely because if regression took place on first difference cointegrating variables, that would result in misspecification of errors. The Granger causality can then be said to only represent a correlation between the present value of one variable and the previous value of others. Furthermore, Brooks (2002) argues that this does not necessarily suggest that the activity of variable is a result of another. Conclusively, although causality in VAR investigates whether the present variable A can be explained by the previous values of variable B, the sign of the relationship or how long term effects last is still not clear. The results gathered from the impulse responses and variance decomposition analysis further brings clarity to these concerns.

3.4.3 General Impulse Response Function

General Impulse Response Function (GIRF) is a tool that is employed to evaluate the persistence and relative effects of several macroeconomic shocks. Furthermore, the empirical observations made are also used for the development of various theoretical models. A vector autoregressive (VAR) model is used to characterise the effects of the macroeconomic shocks.

According to Lin, (2006), the collective effects of unit impulses are estimated by selective summations of the coefficients of the impulse response functions. On the contrary, the traditional impulse response analysis needs orthogonalization of shocks as argued by Lutkepohl and Reimers, (1992). The authors further highlighted that the output differs with the order of the variables in the VAR. In the case where the residuals have a high correlation between them, the more significant the order of the variables becomes. Pesaran and Shin, (1998) developed the generalised impulse response function which is able to adjust the impact of a varied ordering of variables on impulse response functions, this way, the problem might be overcome.

Historical patterns of correlations are tools used to plot the generalised impulse responses. This study displays graphs of each variable in response to the other. There are no particular calculations that are attached to the findings of the generalised impulse response functions thereof. It is difficult to observe the impact or response of variables on each other if the VAR models take into account more equations or lags. The interactions between the equations are shown with the application of the variance decomposition analysis. Authors such as Brooks, (2002), suggest that variance decompositions indicate the portion of activity in the dependent variables that are caused by the independent variables and it further gives a clear indication of the components of variances of dependent variables. Furthermore, variance decomposition analysis is a significant tool used to estimate the volatility of the future outcome of financial series; however, that is not the focus of this study. Basically, variance decomposition is viewed as a confirmation of impulse responses as the results offer similar information.

3.4.4 Vector Error Correction Model

Error Correction is a part of the model that looks at how fast the past deviations from equilibrium are corrected. Error Correction Models (ECMs) are a category of multiple time series models that directly estimate the speed at which a dependent variable - Y - returns to equilibrium after a change in an independent variable - X. ECMs are useful for estimating both short term and long term effects of one time series on another. ECMs are useful models when dealing with integrated data, but can also be used with stationary data. In order to explain the complex interrelationship between stationary variables in empirical observations, a vector autoregressive (VAR) model is used as a framework.

Beforehand, a test for stationarity in the data is conducted. In the case where the data is nonstationary at levels, it is further differenced once and as a result the data will then be stationary at their first differencing. In the event that the time series is nonstationary, the VAR framework will further be modified to cater for the proximity of the relationships in the series. The vector error correction model is a framework that is applicable if and when the variables are stationary in their first difference (i.e., I (1)). Furthermore, the VECM caters for the cointegration of variables in a model.

The vector error model can expressed as:

$$\Delta Y_t = a_1 + p_1 e_1 + \sum_{i=0}^{n} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} \sigma_i \Delta X_{t-i} + \sum_{i=o}^{n} \gamma_i Z_{t-i} \text{ ....(3.20)}$$

where:

Δ, is the first difference operator,

GDP, MCAP, VLT AND EXCHR are independent variables respectively, logarithmic forms of Gross Domestic Product (GDP) growth, Market Capitalization, Value of Transaction and

Ω is the lagged error term.

3.4.5 Diagnostic and Stability Test

After a test of the VECM is conducted, the study will employ an ADF test to check for stationarity. This will either confirm or go against the existence of cointegration based on the characteristics of the regressors in the model. The test also helps to justify the results gathered based on its significance statistically in the expressed model or equation. In order estimate or gather these results, this study employs only three, which are; the histogram and normality test, the Chow and lastly the Ramsey Reset and Cusum test (Engle& Granger, 1978). For the purpose of this paper the Ramsey reset and cusum test is applied.

3.4.5.1 Ramsey Reset

The Ramsey Regression Equation Specification Error Test (RESET) test (Ramsey, 1969) is a general description examination for the linear regression model. The Ramsey test detects the non-linear blend of the variables. Basically, this test helps detect the non-linear hidden values that can assist to describe the dependent variable in a simpler manor.

Granger and Lee (1999) wrote a paper where the sequential collective effects on the power of Ramsey's (1969) RESET[2] suggest that the aggregation is said to simplify nonlinearity. The RESET test uses the critical values of the F-distribution and is based on the Lagrange Multiplier principle. There are various authors that have studied the RESET test in cases where the equations are singular, such as, Ramsey and Gilbert (1972); Thursby and Schmidt (1977); however the following example shows the RESET test in various time frames and showcasing the power and size of the test using data.

Below is a standard linear regression model;

$$y = X\beta + \mu \text{..........} \quad (3.21)$$

Furthermore, assume that stationary time-series exists on the data X and Y. Choose a Txh matrix Z of "test variables," to apply simple Ordinary Least Squares (OLS) to the equation:

$$y = X\beta + Z_a + \varepsilon \text{..........} \quad (3.22)$$

and test the hypothesis: $H_0 : \alpha = 0$ using a standard F stat:

$$F = \frac{(R_2^2 - R_1^2)/h}{(1 - R_2^2/(T-(k+1+h)}\approx F\left[h,(T-(k+1h))\right] \text{..........} \quad (3.23)$$

R_1^2 *obtained from* (1) *and* R_2^2 *is obtained from* (2).

Linearity can be rejected at 5% level if the output of the F value is significant at that level which is implied by (1). Ramsey's (1969) choice for test variables is:

$$Z = \hat{y}_t^2, \hat{y}_t^3, \hat{y}_t^4 \cdots \hat{y}_t^k \qquad (3.24)$$

Where $\hat{y}_t^2 = X_x^1 \hat{\beta}$

The null model (1) further produced the simple OLS estimator which is the β.

3.4.5.2 CUSUM

On the contrary, the Chow test is employed to check if the regressors that share a linier regression on separate data are equal. Furthermore, a stability test is employed to check for the outcome of the model in an estimated time frame and whether the results are suitable for the sample period used to fit it, which is where a CUSUSM test comes in.

In empirical research, although there are many other cointegration tests, the most commonly used approaches to test for cointegration is the residual-based procedure. McKinnon, (1991) produced results where he made an analyses and reported the critical value results of the residual-based procedure, of which, Phillips and Oularias, (1990) did a similar report the year before. To conduct these stability tests, the outputs of the residuals generated from the cointegrating regression are taken and unit root tests are applied to these residuals. In the absence of cointegration in the individual time series, the residuals are said to be stationary. In this case, unit root tests are applied to the residual process, furthermore, the null hypothesis that there is stationarity corresponds with the null hypothesis that there is no cointegration in the vector time series.

In the cointegration procedure, the alternative cointegration hypothesis becomes the subject hypothesis and the procedure follows the same way as a unit root test would. However, the data is not as raw; it proceeds from the residuals of the cointegrating regression. A unit root test procedure is originally designed to test for the null hypothesis of no cointegration. Given the aforementioned, the residual-based procedure is best suited to test for the null hypothesis of cointegration. Scholars such as Shin, (1994) employed a component representation of the time series and proposed a residual-based test in cases where the null hypothesis of cointegration is tested. He based his suggestion on the KPSS (Kwiatkowski et al., 1992) test for stationarity.

In relation to Shin, (1994), Park (1990), and Park et al. (1988), also used similar methods to test for cointegration. Lastly, the Kuctuation in the residual process of a cointegrating regression is another tool that can be used to test for the null hypothesis of cointegration. Basically, the CUSUM (or MOSUM) test is a stability test that can be added to the residuals in a cointegrating regression and it further provides an alternative method of testing for the null hypothesis of cointegration. Brown et al., (1975), first introduced the CUSUM test when a study on the structural changes was conducted and the original test statistic was developed on the cumulated sums of recursive residuals. The extension of the CUSUM test to OLS residuals was further performed by Ploberger and Kramer, (1992).

3.4.6 Residual diagnostics

Engle and Granger, (1978) show that a properly structured model is determined by using normality test. The test also shows how a random variable can be normally distributed given the underlying data set. In simple terms, the test is a way of choosing a model and can be measured in various ways. In descriptive statistics for example, the test can be employed in order to see the level or percentage of goodness of fit of a normal model to the data (Engle& Granger, 1978). Once you use the test and the goodness of fit is poor, that is anything below 50%, then the data is not well modelled. The normality test generates a histogram of the residuals, and the Jarque-Bera statistic for testing their normality. In order to get the skewness and kurtosis, and how they differ with the normal distribution, the Jarque-Bera statistic is employed. Furthermore, there are a number of tests in the residual diagnostic; Histogram-normality test (Jarque-Bera), Serial correlation LM test, the Heteroskedasticity, the Shapiro-Wilk test etc. This study adopts all of the aforementioned with the exception of the Shapiro-Wilk tets.

3.4.6.1 Jarque- Bera statistic

A Jarque-Bera statistic test is employed in a study to check if the respective variables follow a probability distribution, in this case the stock market and exchange rate. The test was developed by Jarque-Bera who had an intension of using the test for asymptotic or large sample tests. Skweness and kurtosis are the two measures that are computed and the test statistic adopted is as follows;

$$JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{4}\right] \quad \text{.......(3.25)}$$

Where; n = sample size,

S = skweness coefficient, and

K = kurtosis coefficient

In the case where a variable is normally distributed, S = 0 and K = 3. The JB test is a normality test of joint hypothesis that S and K are 0 and 3 respectively.

The Jarque and Bera, (1980, 1987) are the most popular normality tests that are employed on regression residuals and are gladly welcomed by various econometricians. Apart from the JB test, there are other normality tests such as the Shapiro-Wilk tets, the Kuiper test as well as the Kolomogorov-Smimov and the Cram´er-von Mises tests which are used in differently according to their samples. There are various normality tests, as stated above, however the JB test is best suited in the normal distribution tests that are found in the Pearson family, which can be compared to its counter normality tests, as suggested by authors in the likes of Jarque and Bera, (1987) and Urzu´a (1996) who expressed these views in various forms of literature.

According to Thadeweld and Büning, (2004), JB is asymptotically chi-squared distributed with two degrees of freedom because JB is just the sum of squares of two asymptotically independent 0standardized normals. In addition to the set view, Bowman and Shenton (1975) share the same light. The Null (H_0) will be rejected at level α on the condition that; JB ≥ χ2 1−α, 2. In summary, the JB test is used to calculate for regression residuals in cases where there are linier regressions. A modified version of the JB test was developed by Urzu´a,(1996), which became the JBU test. The JBU test involves standardizing the kurtosis k and the skweness in the JB formula in the following manor;

$$JBU = \left(\frac{S^2}{v_S} + \frac{(K-e_K)^2}{v_K}\right) \quad \text{.......(3.25)}$$

3.4.6.2 Shapiro-Wilk test

The Shapiro-Wilk test is driven by the probability plot which takes into account the regression of the ordered interpretations on the anticipated outcomes of the order statistics from the hypothesised distribution. The test is defined by;

$$SW = \frac{\left(\sum_i^n = a_i X_{(i)}\right)^2}{\sum_i^n = 1\left(X_i - \bar{X}\right)^2} \quad \text{..........(3.26)}$$

$X = (X_{1,\dots\dots} X_n)$ is a vector of random variables and X_0 the corresponding ordered vector. $\bar{X}$ is the usual sample mean. The weights a_i, $i=1,\dots\dots\dots,n$, are calculated like this. $Y = (Y_{1,\dots\dots}, Y_n)$ is a vector of random variables from a normal distribution and Y() again the corresponding ordered vector. In order to determine a_i, the vector of expectation values has to be calculated as well as the covariance matrix of $Y_0 : m' = (m_{1,\dots\dots,} m_n)$ where $m_1 = E(Y_{(i)})$ *and where* $v_{ij} = Cov(Y_{(i),} Y_{(j)})$. The vector of the weights a_i yields as follows:

$$SW = m' V^{-1}[(m' V^{-1})(V^{-1} m)]^{-1/2} \quad \text{..........(3.27)}$$

The null hypothesis is rejected if;

$SW \leq w_a$.

For the components of the vector, there is $a_i = -a_{n-i+1,}$, they are tabulated by Shapiro and Wilk (1965) for n ≤ 50, where critical values w_a of SW are given, too (Shapiro et al.,(1968), (Shapiro and Francia,(1972).

3.4.6.3 Serial correlation LM tests

Investopidia (2013) defines serial correlation as the relationship between a given variable and itself over various time intervals. To test for serial correlation or autocorrelation, there are various ways to go about it. This study however, uses the Breusch-Godfrey LM test. The LM test can be used especially since the data used is large.

3.4.6.4 Heteroskedasticity test: White

The White or Breush-Pagan test is used by various econometricians to check if the one or more of the variables used is proportionality factor in the heteroskedasticity process. In comparison to other diagnostic tests that test for heteroskedasticity, the White test does not assume a particular or specific form of heteroskedasticity. The test relies on the auxiliary regression with squared residuals as dependent variables and regressors given by the regressors of the original model, their cross-products and squares.

The White test therefore adopts the following regression model;

$$\hat{y}_t = b_0 + b_1 x_{1f} + b_2 x_{2f}, \qquad (3.28)$$

then $e_f = y_f - \hat{y}_f$

3.5 Conclusion

For the presentation of the results, the study adopts the ADF, KPSS and the PP unit root test to check for stationarity, Engle Granger is employed to test for causality or co-integration between Capital markets and Economic growth (Engle, 1978) residual and diagnostic tests that deal specifically with the model. The VECM tests are also used to detect the short-run relationship and the other hand, the long run relationship is expressed by the General Impulse Response Function as well as the signs associated to the relationship between the variables. The software that is used for the analysis of data is E-views7. In the following chapter, an analysis of the relationship is carried out; furthermore interpretation and discussion of results is highlighted.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter focuses on an analysis of the data gathered on the various variables used. The aim is to discuss the impact and significance of capital markets on economic growth in South Africa. Data was gathered from Quantec for capital markets (MCAP and VLT), the SARB was used for GDP and EXCHR. A test of stationarity is conducted adopting the ADF, PP and KPSS unit root tests. To check for the causality, the Engle Granger will be employed. Other tests employed are the VECM test, Johansen cointegration test, the GIRF and the diagnostic and stability tests.

4.2 Unit root tests

The unit root test is employed solely to check for stationarity trend in a given time series. The study employs variables, Market Capitalization (MCAP), Value of Total Issues (VLT), Exchange rate (EXCHR) and lastly the dependent variable economic growth (GDP). Graphical representations are used to detect stationarity through mere eye balling method. The following is the hypothesis for stationarity in the unit root test;

H_0: nonstationarity

H_1: stationary

4.2.1 Visual inspection of unit root test results

Figure 4.1 Graphical representations of GDP, MCAP, VLT AND EXCHR at levels

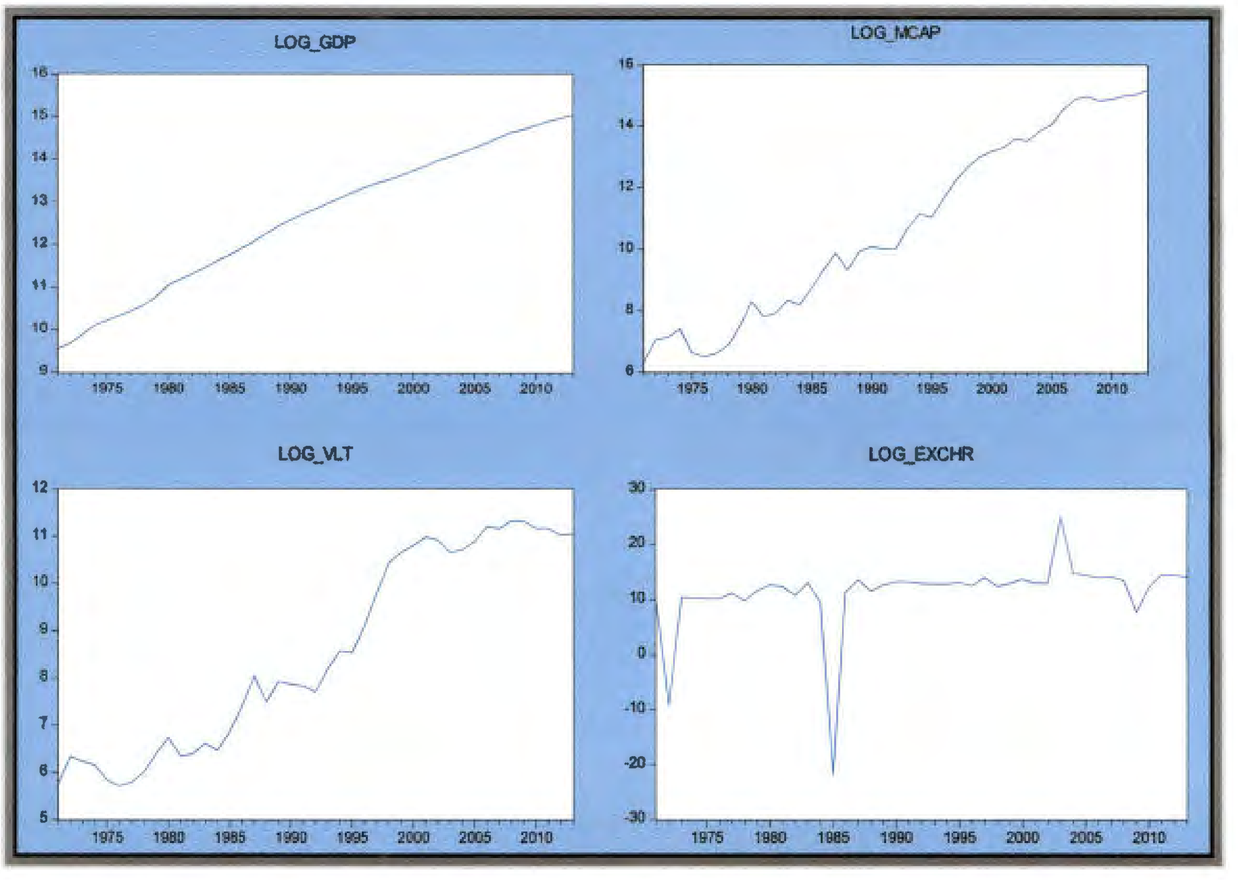
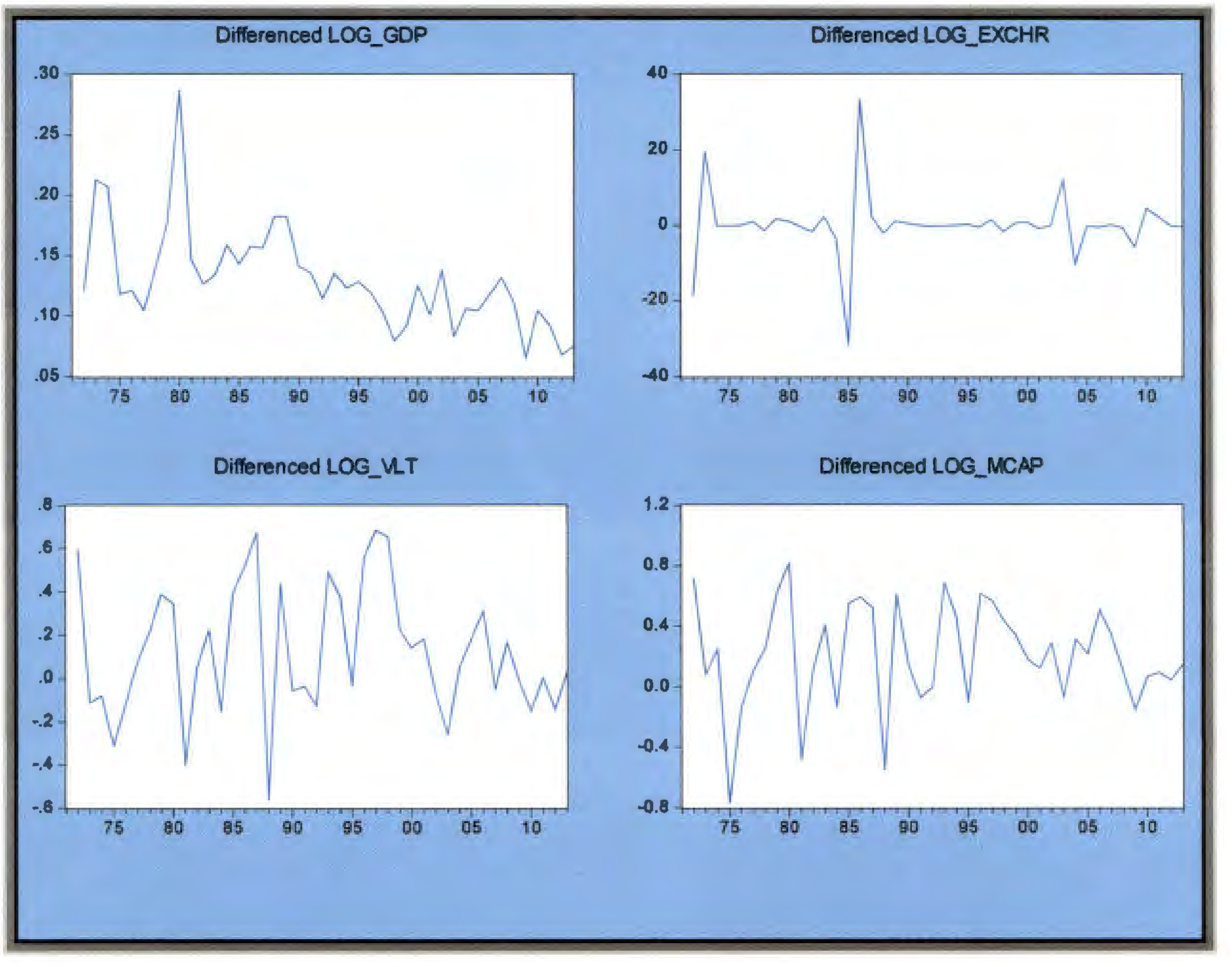


Figure 4.1 shows an upward slope for GDP, MCAP and VLT. EXCHR on the other hand shows a constant trend over time; apart from the year 1985, where volatility took place. If a straight line were to be drawn through either of the graphs, it would cut once on GDP, MCAP and VLT. However, the straight line would cut more than once on the exchange rate graph which would suggest that the mean and covariance are constant over time. By mere observation, the output would suggest that there might be stationarity for EXCHR, however all other variables (MCAP, VLT and GDP) might be nonstationary. A further test at the 1st difference could shed more light to this regard.

Figure 4.2 Graphical representations of GDP, MCAP, VLT AND EXCHR at the 1st difference



As far as Figure 4.2 is concerned there is a change from the first observation made at levels. By mere observation, it appears that there is a sign of stationarity for LGDP, which goes for all other variables (MCAP, EXCHR and VLT). EXCHR still shows a sign of stationarity. A conclusive result on the existence of stationarity cannot be given at this stage. A unit root test is required to substantially conclude the matter.

4.2.2 ADF, PP and KPSS Unit root tests results

If a time series observation show results that are nonstationary, the regression results might be spurious. It is therefore imperative to establish stationarity for the time series observed. For the purpose of this paper the Augmented Dickey-Fuller (ADF), Phillips Perron (PP) ant the Kwiatkowski-Phillips-Schmidt-Shin (KPSS). The model therefore adopts the following model;

H_0: nonstationarity

H_1: stationary

Table 4.1 ADF Unit root test for variables at levels;

Variables	ADF Lags	ADF test statistic	Mackinnon critical Value at 5%	Remarks
LMCAP	3	-2.471526	-3.5207	Nonstatonary
LVLT	3	-1.582098	-3.5207	Nonstationary
LEXCHR	3	-6.228681	-3.5207	Stationary
LGDP	3	0.128823	-3.5207	Nonstationary

From Table 4.1 all the variables are non-stationary, with the exception of exchange rate which is stationary at levels. LMCAP, LVLT and LGDP have their ADF statistics less than Mackinnon critical value at 5%. The next step would be to test for stationarity at first difference.

Table 4.2 ADF Unit root test for variables at the 1st difference

Variables	ADF Lags	ADF test statistic	Mackinnon critical Value at 5%	Remarks
ΔLMCAP	3	-6.470559	-2.9350	Stationary
ΔLVLT	3	-5.631937	-2.9350	Stationary
ΔLEXCHR	3	-7.536682	-2.9350	Stationary
ΔLGDP	3	-5.268702	-2.9350	Stationary

The results in Table 4.2 show that all the variables are stationary at the first difference given that their respective ADF statistics are greater than the Mackinnon critical values at 5%. The results furthermore suggest that the variables are cointegrated in the order one (1). There the null hypothesis of nonstationarity is rejected.

Table 4.3 PP unit root test for variables at levels

Variables	PP Lags	PP test statistic	Mackinnon critical Value at 5%	Remarks
LMCAP	3	-2.524305	-3.520	Nonstationary
LVLT	3	-1.735079	-3.520	Nonstationary
LEXCHR	3	-6.225669	-3.520	Stationary
LGDP	3	0.485878	-3.520	Nonstationary

All the variables in Table 4.3 are nonstationary, with the exception of exchange rate which is stationary at levels. PP statistics of LMCAP, LVLT and LGDP are less than Mackinnon critical value at 5%. The next step would be to test for stationarity at first difference.

Table 4.4 PP Unit root test for variables at the 1st difference

Variables	PP Lags	PP test statistic	Mackinnon critical Value at 5%	Remarks
ΔLMCAP	3	-6.487368	-3.523	Stationary
ΔLVLT	3	-5.641774	-3.523	Stationary
ΔLEXCHR	3	-20.10268	-3.523	Stationary
ΔLGDP	3	-6.461111	-3.523	Stationary

The PP unit root test results in Table 4.4 show that all variables are stationary at the first difference. The PP statistics is greater than the Mackinnon critical value at 5%. The results furthermore suggest that the variable is cointegrated in the order one (1).

Table 4.5 KPSS unit root test for variables at levels

Variables	KPSS Lags	KPSS test statistic	Mackinnon critical Value at 5%	Remarks
LMCAP	3	0.118885	0.14600	Stationary
LVLT	3	0.112445	0.14600	Stationary
LEXCHR	3	0.052887	0.14600	Stationary
LGDP	3	0.218692	0.14600	Nonstationary

According the results from Table 4.5 all the variables are stationary at levels, with the exception of LDGP which is nonstationary at levels. LMCAP, LVLT and LEXCHR have their KPSS statistics less than Mackinnon critical value at 5%. The next step would be to test for stationarity at first difference.

Table 4.6 KPSS Unit root test for variables at the 1st difference

Variables	KPSS Lags	KPSS test statistic	Mackinnon critical Value at 5%	Remarks
ΔLMCAP	3	0.115847	0.14600	Stationary
ΔLVLT	3	0.133552	0.14600	Stationary
ΔLEXCHR	3	0.325609	0.14600	Nonstationary
ΔLGDP	3	0.098993	0.14600	Stationary

The KPSS unit root test show that all variables are stationary at the first difference, but the exchange rate is nonstationary at the first difference. The KPSS statistics is greater than the Mackinnon critical value at 5%. The results furthermore, suggest that the variable is cointegrated in the order one (1). In conclusion, it appears that from the visual inspection at levels, only one variable (LEXCHR) showed any sign of stationarity whereas the rest were non stationary. In addition, the ADF and PP test confirmed the proposed output that LGDP, LMCAP and LVLT were non stationary at levels. In contrast, the KPSS showed a different view. The test revealed that only LGDP was stationary at levels leaving all other variables non stationary. Ultimately, all the variables were stationary at their first difference (1^{st}) for both the visual inspection and the unit root tests.

4.3 Cointegration Test results

The Johansen cointegration test is adopted to check for a long-run relationship between the variables. The Engle Granger cointegration test caters for one cointegrating series, whereas Johansen cointegration approach caters for multivariate series.

Table 4.7 Unrestricted cointegration rank test (trace test)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	5 % Criical value	Prob**
None*	0.579794	79.79452	47.85613	0.0000
At most 1*	0.516822	45.98113	29.79707	0.0003
At most 2*	0.314574	17.61371	15.49471	0.0236
At most 3	0.071253	2.882819	3.841466	0.0895

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The first section of Table 4.7 shows the number of cointegrating equations. The results show that the trace test indicates that there are 3 cointegrating vectors at 0.05% level. The results suggest that there is a long run relationship between the 4 series in the form of a linear combination.

Table 4.8 Unrestricted cointegration rank test (maximum eigen value)

Hypothesized No. of CE(s)	Eigen value	Max- Eigen statistic	5% Criical value	Prob**
None*	0.579794	33.81339	27.58434	0.0069
At most 1*	0.516822	28.36742	21.13162	0.0040
At most 2*	0.314574	14.73089	14.26460	0.0422
At most 3	0.071253	2.882819	3.841466	0.0895

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Furthermore, Table 4.8 also produces the number of cointegrating equations. The maximum eigen test shows that there are 3 cointegrating vectors at 0.05% level. The results further suggest that there are indeed three cointegrating vectors and that there is a long run relationship between the 4 series. The statement is validated by an argument based on a view given by Barnerjee; Dolado; Galibraith and Hnery, (1993) that even if there were variations in the results produced by the trace and maximum eigen tests, the maximum eigen test results are more reliable.

4.4 Vector Error Correction Model

In the existence of cointegration in a time series, the result show that there is a long-term equilibrium relationship between the variables. The VECM is adopted to measure the short-run properties of the cointegrated series. However, if there is no cointegration in the series, the VECM test is skipped, therefore, the study proceeds to Granger causality tests to check for causality amongst the variables. The VECM is a framework that is applicable if and when the variables are stationary in their first difference (i.e., I(1)) . Furthermore, the VECM caters for the cointegration of variables in a model.

Table 4.9 Vector Error Correction Model

Dependent variable; D(LOG_GDP)

Error Correction:	D(LOG_GDP)	D(LOG_EXCHR)	D(LOG_VLT)	D(LOG_MCAP)
CointEq1	-0.012465	-0.350802	-0.029515	-0.016705
D(LOG_GDP(-1))	0.171990	-43.03842	-1.799309	-1.092170
D(LOG_GDP(-2))	-0.141722	63.63944	-0.283642	-1.296091
D(LOG_EXCHR(-1))	0.000615	-0.461804	-0.008155	-0.011137
D(LOG_EXCHR(-2))	0.000219	-0.331780	-0.017616	-0.022200
D(LOG_VLT(-1))	-0.010612	-6.480851	0.206411	0.218782
D(LOG_VLT(-2))	0.032722	13.70430	0.179293	0.247980
D(LOG_MCAP(-1))	0.019719	12.82838	-0.053090	-0.191756
D(LOG_MCAP(-2))	-0.002090	-12.52819	-0.081433	-0.198260
C	0.117734	-3.345204	0.383046	0.549685

In Table 4.5, the VECM the cointegration rank displays the number of cointegrating vectors. For each variable, there is one rank, which stipulates that there is one linearly independent combination that will be stationary after having been non stationary. Furthermore, any short-term change that might occur amongst the independent variable and the dependent variable will produce a stable long-run relationship between the variables. In any output where Error Correction Model (ECM) is observed, there are few aspects to pay close attention to. Adamopoulos (2010) states, that the size of the ECM shows how quickly the disequilibrium can adjust itself towards a long run equilibrium position. The projected coefficient of VECM of -0.124 is significant with theory that suggests that the sign of a VECM coefficient in an output should be negative.

The t-statistic is -2.76 which is also relatively high in order for equilibrium to be restored in the long run relationship between the dependent and independent variable, it is essential for the sign of the coefficient to be negative, which will further shows that there is no problem in the relationship. The results further indicate that any short term changes in the relationship between the dependent and independent variables will be easily corrected to a stable long run relationship among the variables. Furthermore, given that the VECM test indicates the cointegration relationship of the variables, the output is in agreement with both the trace and maximum eigen tests. The tests suggested that the variables are cointegrated and have at most three (3) cointegrating vectors, which also show that the model is correctly specified. This supports the findings that capital markets do have an impact on economic growth in South Africa. In definite terms, the projected coefficient of -0.124 indicates that about 12% of the disequilibrium of the past year comes back to the long run equilibrium in the following year. In addition, the results show a long term causal relationship between the exogenous and endogenous variables.About 50% of the growth is explained by capital markets in South Africa, which is given by a fairly positive R^2 that stands at -0.50. The other 50% can be accounted for by the variables that were not part of the model (omitted).

4.5 Granger causality

Table 4.10 Granger causality test

Null hypothesis	F statistic	P-value	Decision
LOG_MCAP does not Granger cause LOG_GDP	1.42832	0.2521	Accept the null hypothesis.
LOG_GDP does not Granger cause LOG_MCAP	5.94226	0.0023	Reject the null hypothesis
LOG_EXCHR does not Granger cause LOG_GDP	0.11805	0.9489	Accept the null hypothesis
LOG_GDP does not Granger cause LOG_EXCHR	0.89992	0.4516	Accept the null hypothesis
LOG_VLT does not Granger cause LOG_GDP	1.25348	0.3063	Accept the null hypothesis
LOG_GDP does not Granger cause LOG_VLT	4.24734	0.0121	Reject the null hypothesis
LOG_EXCHR does not Granger cause LOG_MCAP	5.93907	0.0023	Reject the null hypothesis
LOG_MCAP does not Granger cause LOG_EXCHR	1.89172	0.1502	Accept the null hypothesis
LOG_VLT does not Granger cause LOG_MCAP	0.93604	0.4343	Accept the null hypothesis
LOG_MCAP does not Granger cause LOG_VLT	1.14654	0.35448	Accept the null hypothesis
LOG_VLT does not Granger cause LOG_EXCHR	1.57206	0.21147	Accept the null hypothesis
LOG_EXCHR does not Granger cause LOG_VLT	5.08899	0.0053	Reject the null hypothesis

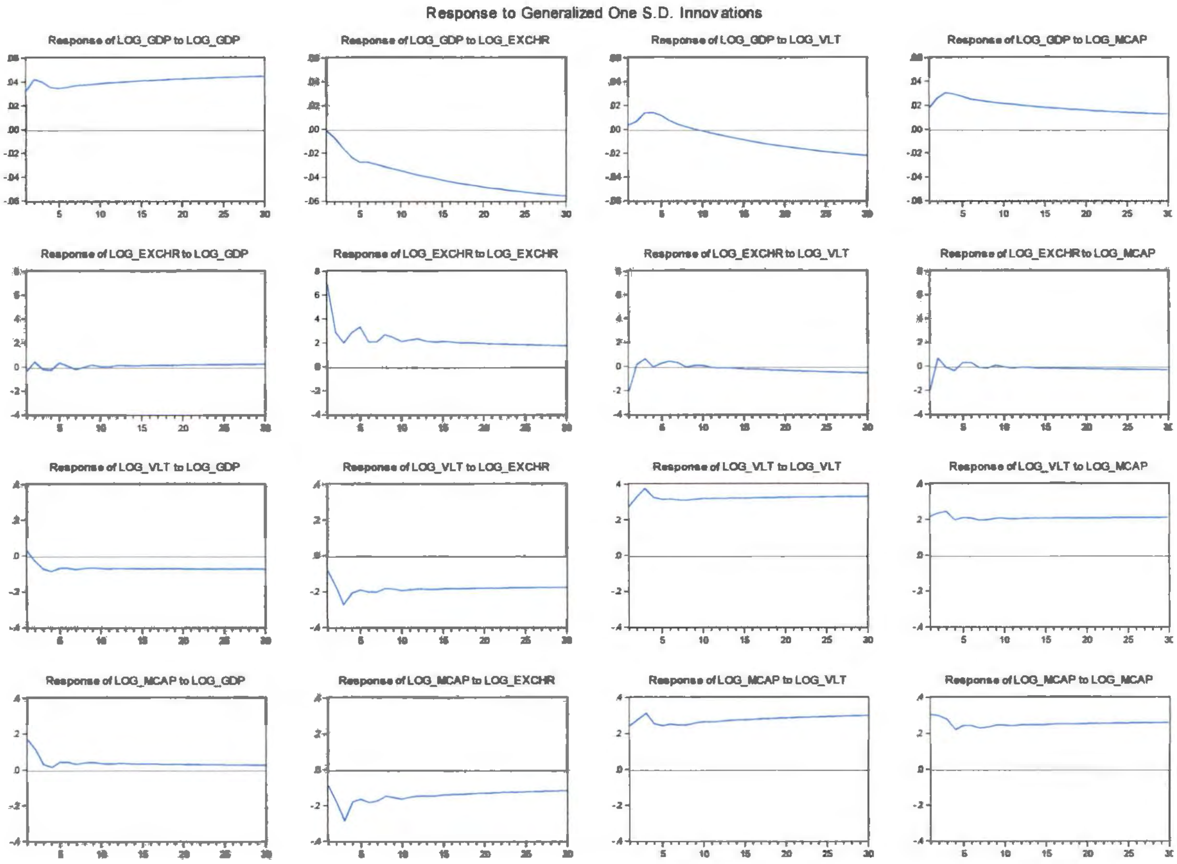
Decision rule: reject the null hypothesis if P-value is less than 5% significance level or;

Reject H_0 $if\ P-valueis<0.05$

The causality test shows a unidirectional causation between LGDP and LMCAP. It further indicates that there is no causality between LEXCHR and LGDP. However, it also shows that LGDP granger causes LVLT, although LVLT does not granger cause LGDP, which suggests a uni-directional causation. The same applies for LEXCHR and LMCAP, where LEXCHR granger causes LMCAP and LMCAP does not granger cause LEXCHR. In contrast, there is no causality between LVLT and LMCAP, whereas LVLT granger causes LEXCHR and LVLT fails to granger cause LEXCHR. The results clearly suggest that there is a positive relation between capital markets (in the form of LMCAP and LVLT) and economic growth in South Africa. Moreover, the results are in agreement with the previous cointegration results that showed three cointegrating vectors in the model.

4.6 General Impulse Response Function (GIRF)

Figure 4.3 GIRF



The Granger causality shows that capital markets have an impact on economic growth; however it does not reveal the time span of the impact or the relationship thereof. The GIRF serves a purpose in the sense that the impulse responses provide more details on the impact that capital markets have on economic growth. There are 16 graphs that represent the relationship between the variables, the signs of the relationship and their long-term effects thereof. Figure 4.7 depicts the generalised impulse response functions with a thirty year response of one variable to one unit of innovations of another variable. Using the Granger causality as a foundation, the study solely reports the figures of impulse response for cases where the variables showed Granger causality.

The interpretation of each graph is as follows;

4.6.1 Response of LOG_GDP to LOG_MCAP

In the first few years, it appears that the response of log_GDP to log_MCAP is positive. The outcome is in agreement with an analysis made by Minier, (2003) who stated that the impact of stock markets on economic growth is positive. However, a long run positive outcome is favourable for countries with developed stock markets, whereas for countries with underdeveloped stock markets will ultimately have a negative relationship. Given the thirty year period observation, the graphs depicts that the two variables might have a negative relationship few years post the thirty year frame. The results are in agreement with the Granger causality results that indicated that GDP Granger causes MCAP.

4.6.2 Response of LOG_GDP to LOG_VLT

As in the case for LOG_GDP and LOG_MCAP, the relationship between LOG_VLT and LOG_GDP is fairly positive for the first five years of the observation. A rapid decline takes place in what appears to be the 6th year onwards where the relationship takes a negative turn. The slope of the graph is negative, which indicates that the relationship is negative at this stage. The graph also depicts that a negative relationship exists long after the thirty year time frame.

4.6.3 Response of LOG_EXCHR to LOG_MCAP

On the contrary, the response of LOG_EXCHR to LOG_VLT is substantially positive. The response remains constant for the first five years and shows a strong relationship between these two variables. It soon corrects itself in the 8th or 9th year. However, during the last decade (20-30), the graph shows a horizontal slope that could suggest that the future outcomes of the relationship could take a different turn. Te results are also in agreement with the Granger causality output which showed that LOG_EXCHR Granger causes LOG_MCAP.

4.6.4 Response of LOG_EXCHR to LOG_VLT

The response of LOG_EXCHR to LOG_VLT starts of negatively for the first two to three years. A sharp change occurs at the end of the third year, which was followed by a decline in the response in the fifth year. The graph shows that the response is constant and further changes course to a negative in the second decade. It is in agreement with the output results of the Granger causality that showed that EXCHR Granger causes VLT.

4.7 Diagnostic and stability tests

4.7.1 Ramsey RESET test

The Ramsey test detects the non-linier blend of the variables. Basically, this test help detect the non-linier hidden values that can assist to describe the dependent variable in a simpler manor.

Decision: $reject\ H_0\ if\ P-value < 0.05\ significance\, level$

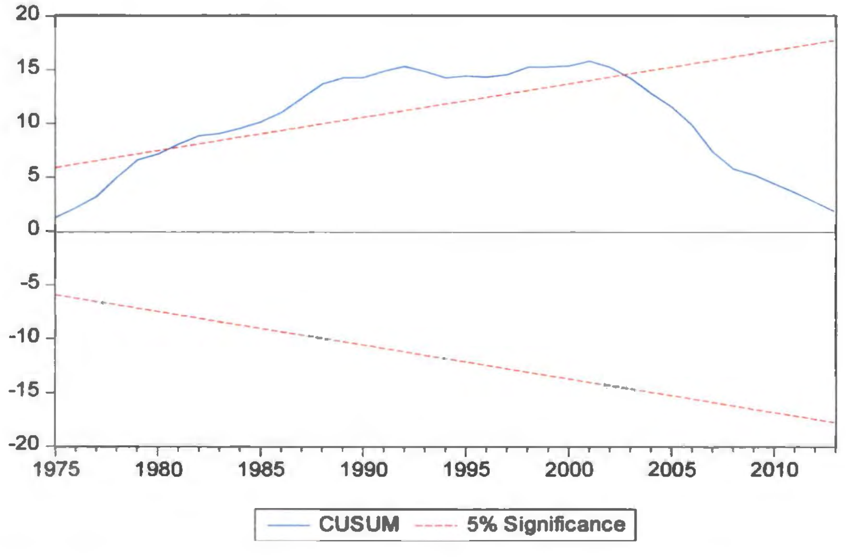
Table 4.11 Diagnostic test

Diagnostic test	Null hypothesis	P-value	Decision
Ramsey RESET test	Model has no specification error	0.0000	Reject the null hypothesis

*See full output in the appendix.

4.7.2 CUSUM test

Figure 4.4



The CUSUM test is one of the most frequently used methods to detect change points and was proposed by Inclan and Tiao (1994). The CUSUM test checks how well the model is used in order to determine the impact and significance of capital markets on economic growth. In table 4.9, the test concludes that the model was unstable. The conclusion was drawn when the test fit within the 5% significance bounds during 1975 -1980. However there is a sense of instability from the year 1980 -2005. As from the year 2005 to 2010, the model regains stability.

4.8 Residual diagnostics

Figure 4.12 Residual diagnostics

Diagnostic test	Null hypothesis	P-value	Decision
Serial Correlation LM test	Residuals do not have serial correlation	0.0000	Failure to accept the null hypothesis
Heteroskedasticity test: White	Residuals do not have heteroskedasticity	0.4329	Failure to reject the null hypothesis
Jarque – Bera test	Residuals are not normally distributed	0.126	Failure to reject the null hypothesis

Decision rule; $reject\ if\ H_0\ is < 0.05\ significance\ level$

Although the Serial correlation test shows that residuals have serial correlation, the white test indicates that residuals do not have heteroskedasticity. Furthermore, the residuals are not normally distributed.

CHAPTER 5

CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

In this chapter, the study answers the research question and further brings forward recommendations on what can be done in the lines of capital markets and economic growth in South Africa. Theoretical literature highlighted that there are various factors that contribute to the long term economic growth of any country, especially developing countries. It is suggested that countries such as South Africa should focus on the key economic objectives such that they ameliorate their low economic conditions. The literature further showed that an added advantage is exploiting areas of abundance as suggested in chapter one.

Authors such as Schumpeter, (1911) highlighted that financial sector development is essential for any economy to attain sustainable growth. He noted that the more developed a financial sector is, the more capable it is to absorb and utilize capital markets in the long run. Moreover, he pointed out that not only is financial development essential and good for economic growth, it in actual fact causes economic growth. Although Schumpeter, (1911) emphasized the significance of financial sector development, which includes the banking sector (Berthelemy and Varoudakis, 1996), other authors brought forward factors such as macroeconomic stability, income levels (Gracia and Liu, (1999), macroeconomic stability (Nacuer et al., 2007) that also contribute to sustainable economic growth.

5.2 Summary of findings

As in the theoretical findings, the empirical results also illustrate an ambiguity with regards to the impact of capital markets on economic growth in South Africa. In terms of causality between economic growth and financial markets, Garretsen, (2004) found the following: a 1% improvement of economic growth determines a 0.4% rise of market capitalization/GDP ratio. Beck, et al., (2006) also concluded that there is a positive correlation between capital market development and economic growth. To better explain this phenomenon, Bose (2005) developed a financial model that explains the positive correlation between stock market development and economic growth which is solely based on the assumption that for levels of GDP per capita higher than a certain threshold the information costs become lower than bankruptcy costs, determining the development of capital markets.

Various authors have investigated the relationship between capital market development and economic growth in different countries. The long run relationship between stock market development (measured by market capitalization and number of listed shares) and economic growth was studied by Nieuwerburgh, et al., (2006) in Belgium. In their study, they adopted the Granger causality tests and highlighted that stock market development had a causal impact on economic growth in Belgium, with the focus period 1873-1935 not excluding the actual analysis period (1800-2000) with disparity taking place due to institutional changes that have an impact on the stock exchange.

5.3 Conclusion

The results gathered from the econometric tests provide enough room to suggest that capital markets have a positive impact on economic growth. Literature alone could not give a view on the causal relationship between capital markets and economic growth in South Africa. The Johansen cointegration test was adopted in the study and it shows 3 cointegrating vectors. The VECM test was conducted right after the cointegration test, which lead to a Granger causality test to detect the direction of the causality. Although South Africa forms part of the fastest growing countries in Africa and the world, empirical review shows that the lack of facilities such stability in the macro economy, developed financial systems and political stability, to mention a few, hinders any progress to grow the economy. In conclusion capital markets have a long term positive impact on developed countries than they do on developing countries.

5.4 Recommendations and policy implications

As a way of encouraging long term economic growth, developing countries should attempt to develop their financial sector. Financial development ensures that a country can absorb and utilize financial resources efficiently. A well-developed financial sector attracts foreign investors into the country as the market shares grow through proper facilitation. The exchange rate volatility is also a burning issue, the more volatile the rate is, the less attractive it becomes. The same can be said for the rate of inflation. Every country has distinguished features that set each one apart from the other. A criteria or ratio should be set for countries as individuals not as aggregates given that they might fall under the same class (developed or developing), but have different features. Lastly, infrastructural development is one of the components that make any country attractive.

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APPENDIX.

Unit root

AUGMENETD DICKEY FULLER (ADF)

1.a) ADF: LMCAP at levels

Null Hypothesis: LOG_MCAP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.471526	0.3399
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_MCAP)
Method: Least Squares
Date: 08/05/14 Time: 18:28
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_MCAP(-1)	-0.271963	0.110038	-2.471526	0.0179
C	1.716080	0.617391	2.779567	0.0083
@TREND("1971")	0.065013	0.026664	2.438247	0.0194

R-squared	0.135421	Mean dependent var	0.210751
Adjusted R-squared	0.091083	S.D. dependent var	0.347357
S.E. of regression	0.331160	Akaike info criterion	0.696319
Sum squared resid	4.277009	Schwarz criterion	0.820438
Log likelihood	-11.62269	Hannan-Quinn criter.	0.741813
F-statistic	3.054317	Durbin-Watson stat	1.744026
Prob(F-statistic)	0.058573		

1. b) ADF: LMCAP at the first difference

Null Hypothesis: D(LOG_MCAP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.470559	0.0000
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_MCAP,2)
Method: Least Squares
Date: 08/05/14 Time: 18:41
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_MCAP(-1))	-1.019488	0.157558	-6.470559	0.0000
C	0.162972	0.120083	1.357166	0.1827
@TREND("1971")	0.001797	0.004624	0.388693	0.6997

R-squared	0.524955	Mean dependent var	-0.013893
Adjusted R-squared	0.499952	S.D. dependent var	0.495361
S.E. of regression	0.350290	Akaike info criterion	0.810245
Sum squared resid	4.662719	Schwarz criterion	0.935629
Log likelihood	-13.61003	Hannan-Quinn criter.	0.855903
F-statistic	20.99618	Durbin-Watson stat	1.985036
Prob(F-statistic)	0.000001		

2. ADF: LVLT at levels

Null Hypothesis: LOG_VLT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic – based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.582098	0.7832
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_VLT)
Method: Least Squares
Date: 08/05/14 Time: 18:45
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_VLT(-1)	-0.137463	0.086886	-1.582098	0.1217
C	0.832325	0.442459	1.881135	0.0674
@TREND("1971")	0.021479	0.014727	1.458467	0.1527

R-squared	0.061910	Mean dependent var	0.126561
Adjusted R-squared	0.013803	S.D. dependent var	0.302930
S.E. of regression	0.300833	Akaike info criterion	0.504223
Sum squared resid	3.529508	Schwarz criterion	0.628342
Log likelihood	-7.588686	Hannan-Quinn criter.	0.549718
F-statistic	1.286922	Durbin-Watson stat	1.579222
Prob(F-statistic)	0.287585		

2.b) ADF: LVLT at the 1st difference

Null Hypothesis: D(LOG_VLT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.631937	0.0002
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_VLT,2)
Method: Least Squares
Date: 08/05/14 Time: 18:52
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_VLT(-1))	-0.880391	0.156321	-5.631937	0.0000
C	0.084197	0.102366	0.822513	0.4159
@TREND("1971")	0.000706	0.003997	0.176693	0.8607

R-squared	0.455868	Mean dependent var	-0.013705
Adjusted R-squared	0.427229	S.D. dependent var	0.399992
S.E. of regression	0.302721	Akaike info criterion	0.518344
Sum squared resid	3.482314	Schwarz criterion	0.643727
Log likelihood	-7.626043	Hannan-Quinn criter.	0.564001
F-statistic	15.91797	Durbin-Watson stat	1.909541
Prob(F-statistic)	0.000010		

3.a) ADF: LEXCHR at levels

Null Hypothesis: LOG_EXCHR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.228681	0.0000
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_EXCHR)
Method: Least Squares
Date: 08/05/14 Time: 18:56
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXCHR(-1)	-0.996192	0.159936	-6.228681	0.0000
C	6.982026	2.296073	3.040855	0.0042
@TREND("1971")	0.205178	0.087556	2.343398	0.0243

R-squared	0.498702	Mean dependent var	0.109675
Adjusted R-squared	0.472995	S.D. dependent var	8.800761
S.E. of regression	6.388924	Akaike info criterion	6.615758
Sum squared resid	1591.916	Schwarz criterion	6.739877
Log likelihood	-135.9309	Hannan-Quinn criter.	6.661253
F-statistic	19.39903	Durbin-Watson stat	1.778242
Prob(F-statistic)	0.000001		

3.b) ADF: LEXCHR at the 1st difference

Null Hypothesis: D(LOG_EXCHR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.536682	0.0000
Test critical values:	1% level	-4.205004	
	5% level	-3.526609	
	10% level	-3.194611	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_EXCHR,2)
Method: Least Squares
Date: 08/05/14 Time: 19:02
Sample (adjusted): 1974 2013
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_EXCHR(-1))	-1.879708	0.249408	-7.536682	0.0000
D(LOG_EXCHR(-1),2)	0.343238	0.140952	2.435142	0.0200
C	1.144249	2.454914	0.466106	0.6439
@TREND("1971")	-0.030709	0.096765	-0.317356	0.7528

R-squared	0.756467	Mean dependent var	-0.497391
Adjusted R-squared	0.736173	S.D. dependent var	13.68556
S.E. of regression	7.029465	Akaike info criterion	6.832738
Sum squared resid	1778.882	Schwarz criterion	7.001626
Log likelihood	-132.6548	Hannan-Quinn criter.	6.893802
F-statistic	37.27471	Durbin-Watson stat	2.185705
Prob(F-statistic)	0.000000		

4. ADF: LGDP at levels

Null Hypothesis: LOG_GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.128823	0.9966
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_GDP)
Method: Least Squares
Date: 08/05/14 Time: 19:05
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GDP(-1)	0.004196	0.032568	0.128823	0.8982
C	0.135574	0.315178	0.430149	0.6695
@TREND("1971")	-0.002686	0.004370	-0.614737	0.5423

R-squared	0.386930	Mean dependent var	0.130440
Adjusted R-squared	0.355491	S.D. dependent var	0.041946
S.E. of regression	0.033675	Akaike info criterion	-3.875366
Sum squared resid	0.044227	Schwarz criterion	-3.751247
Log likelihood	84.38269	Hannan-Quinn criter.	-3.829872
F-statistic	12.30715	Durbin-Watson stat	1.561346
Prob(F-statistic)	0.000072		

4. b) ADF: LGDP at the 1st difference

Null Hypothesis: D(LOG_GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.268702	0.0005
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LOG_GDP,2)
Method: Least Squares
Date: 08/05/14 Time: 19:09
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_GDP(-1))	-0.809196	0.153586	-5.268702	0.0000
C	0.147827	0.029283	5.048180	0.0000
@TREND("1971")	-0.001923	0.000533	-3.609180	0.0009

R-squared	0.424813	Mean dependent var	-0.001106
Adjusted R-squared	0.394540	S.D. dependent var	0.041453
S.E. of regression	0.032255	Akaike info criterion	-3.959945
Sum squared resid	0.039534	Schwarz criterion	-3.834561
Log likelihood	84.17887	Hannan-Quinn criter.	-3.914287
F-statistic	14.03272	Durbin-Watson stat	1.723029
Prob(F-statistic)	0.000027		

Appendix 2

PHILLIPS PERON (PP)

1.a) PP: LGDP at levels

Null Hypothesis: LOG_GDP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.485878	0.9989
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001053
HAC corrected variance (Bartlett kernel)	0.000649

Phillips-Perron Test Equation
Dependent Variable: D(LOG_GDP)
Method: Least Squares
Date: 08/05/14 Time: 19:25
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GDP(-1)	0.004196	0.032568	0.128823	0.8982
C	0.135574	0.315178	0.430149	0.6695
@TREND("1971")	-0.002686	0.004370	-0.614737	0.5423

R-squared	0.386930	Mean dependent var	0.130440
Adjusted R-squared	0.355491	S.D. dependent var	0.041946
S.E. of regression	0.033675	Akaike info criterion	-3.875366
Sum squared resid	0.044227	Schwarz criterion	-3.751247
Log likelihood	84.38269	Hannan-Quinn criter.	-3.829872
F-statistic	12.30715	Durbin-Watson stat	1.561346
Prob(F-statistic)	0.000072		

1.b) PP: LGDP at the 1st difference

Null Hypothesis: D(LOG_GDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 15 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.461111	0.0000
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000964
HAC corrected variance (Bartlett kernel)	0.000183

Phillips-Perron Test Equation
Dependent Variable: D(LOG_GDP,2)
Method: Least Squares
Date: 08/05/14 Time: 19:29
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_GDP(-1))	-0.809196	0.153586	-5.268702	0.0000
C	0.147827	0.029283	5.048180	0.0000
@TREND("1971")	-0.001923	0.000533	-3.609180	0.0009

R-squared	0.424813	Mean dependent var	-0.001106
Adjusted R-squared	0.394540	S.D. dependent var	0.041453
S.E. of regression	0.032255	Akaike info criterion	-3.959945
Sum squared resid	0.039534	Schwarz criterion	-3.834561
Log likelihood	84.17887	Hannan-Quinn criter.	-3.914287
F-statistic	14.03272	Durbin-Watson stat	1.723029
Prob(F-statistic)	0.000027		

2.a) PP: LMCAP at levels

Null Hypothesis: LOG_MCAP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.524305	0.3155
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.101834
HAC corrected variance (Bartlett kernel)	0.107312

Phillips-Perron Test Equation
Dependent Variable: D(LOG_MCAP)
Method: Least Squares
Date: 08/05/14 Time: 19:37
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_MCAP(-1)	-0.271963	0.110038	-2.471526	0.0179
C	1.716080	0.617391	2.779567	0.0083
@TREND("1971")	0.065013	0.026664	2.438247	0.0194

R-squared	0.135421	Mean dependent var	0.210751
Adjusted R-squared	0.091083	S.D. dependent var	0.347357
S.E. of regression	0.331160	Akaike info criterion	0.696319
Sum squared resid	4.277009	Schwarz criterion	0.820438
Log likelihood	-11.62269	Hannan-Quinn criter.	0.741813
F-statistic	3.054317	Durbin-Watson stat	1.744026
Prob(F-statistic)	0.058573		

2.b) PP: LMCAP at the 1st difference

Null Hypothesis: D(LOG_MCAP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.487368	0.0000
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.113725
HAC corrected variance (Bartlett kernel)	0.104350

Phillips-Perron Test Equation
Dependent Variable: D(LOG_MCAP,2)
Method: Least Squares
Date: 08/05/14 Time: 19:41
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_MCAP(-1))	-1.019488	0.157558	-6.470559	0.0000
C	0.162972	0.120083	1.357166	0.1827

@TREND("1971")	0.001797	0.004624	0.388693	0.6997

R-squared	0.524955	Mean dependent var	-0.013893
Adjusted R-squared	0.499952	S.D. dependent var	0.495361
S.E. of regression	0.350290	Akaike info criterion	0.810245
Sum squared resid	4.662719	Schwarz criterion	0.935629
Log likelihood	-13.61003	Hannan-Quinn criter.	0.855903
F-statistic	20.99618	Durbin-Watson stat	1.985036
Prob(F-statistic)	0.000001		

3.a) PP: LVLT at levels

Null Hypothesis: LOG_VLT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.735079	0.7177
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.084036
HAC corrected variance (Bartlett kernel)	0.097950

Phillips-Perron Test Equation
Dependent Variable: D(LOG_VLT)
Method: Least Squares
Date: 08/05/14 Time: 19:44
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_VLT(-1)	-0.137463	0.086886	-1.582098	0.1217
C	0.832325	0.442459	1.881135	0.0674
@TREND("1971")	0.021479	0.014727	1.458467	0.1527

R-squared	0.061910	Mean dependent var	0.126561
Adjusted R-squared	0.013803	S.D. dependent var	0.302930
S.E. of regression	0.300833	Akaike info criterion	0.504223
Sum squared resid	3.529508	Schwarz criterion	0.628342
Log likelihood	-7.588686	Hannan-Quinn criter.	0.549718
F-statistic	1.286922	Durbin-Watson stat	1.579222
Prob(F-statistic)	0.287585		

3.b) PP: LVLT at the 1st difference

Null Hypothesis: D(LOG_VLT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.641774	0.0002
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.084934
HAC corrected variance (Bartlett kernel)	0.087836

Phillips-Perron Test Equation
Dependent Variable: D(LOG_VLT,2)
Method: Least Squares
Date: 08/05/14 Time: 19:46
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_VLT(-1))	-0.880391	0.156321	-5.631937	0.0000
C	0.084197	0.102366	0.822513	0.4159
@TREND("1971")	0.000706	0.003997	0.176693	0.8607

R-squared	0.455868	Mean dependent var	-0.013705
Adjusted R-squared	0.427229	S.D. dependent var	0.399992
S.E. of regression	0.302721	Akaike info criterion	0.518344
Sum squared resid	3.482314	Schwarz criterion	0.643727
Log likelihood	-7.626043	Hannan-Quinn criter.	0.564001
F-statistic	15.91797	Durbin-Watson stat	1.909541
Prob(F-statistic)	0.000010		

4.a) PP: LEXCHR at levels

Null Hypothesis: LOG_EXCHR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.225669	0.0000
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	37.90276

HAC corrected variance (Bartlett kernel)	36.75879

Phillips-Perron Test Equation
Dependent Variable: D(LOG_EXCHR)
Method: Least Squares
Date: 08/05/14 Time: 19:53
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXCHR(-1)	-0.996192	0.159936	-6.228681	0.0000
C	6.982026	2.296073	3.040855	0.0042
@TREND("1971")	0.205178	0.087556	2.343398	0.0243

R-squared	0.498702	Mean dependent var	0.109675
Adjusted R-squared	0.472995	S.D. dependent var	8.800761
S.E. of regression	6.388924	Akaike info criterion	6.615758
Sum squared resid	1591.916	Schwarz criterion	6.739877
Log likelihood	-135.9309	Hannan-Quinn criter.	6.661253
F-statistic	19.39903	Durbin-Watson stat	1.778242
Prob(F-statistic)	0.000001		

4.b) PP: LEXCHR at the 1st difference

Null Hypothesis: D(LOG_EXCHR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-20.10268	0.0000
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	53.31211
HAC corrected variance (Bartlett kernel)	9.507552

Phillips-Perron Test Equation
Dependent Variable: D(LOG_EXCHR,2)
Method: Least Squares
Date: 08/05/14 Time: 19:54
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_EXCHR(-1))	-1.436386	0.134594	-10.67197	0.0000
C	2.003822	2.500630	0.801327	0.4279
@TREND("1971")	-0.062893	0.100108	-0.628251	0.5336

R-squared	0.750631	Mean dependent var	0.446405
Adjusted R-squared	0.737507	S.D. dependent var	14.80314
S.E. of regression	7.584258	Akaike info criterion	6.960382
Sum squared resid	2185.797	Schwarz criterion	7.085765
Log likelihood	-139.6878	Hannan-Quinn criter.	7.006040
F-statistic	57.19240	Durbin-Watson stat	2.158790
Prob(F-statistic)	0.000000		

Appendix 3

KWIATKOWSKI-PHILLIPS-SCHMIDT-SHIN (KPSS)

1.a) KPSS: LEXCHR

Null Hypothesis: LOG_EXCHR is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.052887
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	37.15924
HAC corrected variance (Bartlett kernel)	34.99383

KPSS Test Equation
Dependent Variable: LOG_EXCHR
Method: Least Squares
Date: 08/12/14 Time: 22:45
Sample: 1971 2013
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.237501	1.871284	3.867667	0.0004
@TREND("1971")	0.197870	0.076715	2.579286	0.0136

R-squared	0.139608	Mean dependent var	11.39278
Adjusted R-squared	0.118623	S.D. dependent var	6.649591
S.E. of regression	6.242747	Akaike info criterion	6.546113
Sum squared resid	1597.847	Schwarz criterion	6.628029
Log likelihood	-138.7414	Hannan-Quinn criter.	6.576321
F-statistic	6.652718	Durbin-Watson stat	1.987621
Prob(F-statistic)	0.013585		

1.b) KPSS: LEXCHR at the 1st difference

Null Hypothesis: D(LOG_EXCHR) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 23 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.325609
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	75.60771
HAC corrected variance (Bartlett kernel)	2.897923

KPSS Test Equation
Dependent Variable: D(LOG_EXCHR)
Method: Least Squares
Date: 08/12/14 Time: 22:50
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.039725	2.799533	0.014190	0.9887
@TREND("1971")	0.003254	0.113427	0.028684	0.9773

R-squared	0.000021	Mean dependent var	0.109675
Adjusted R-squared	-0.024979	S.D. dependent var	8.800761
S.E. of regression	8.910000	Akaike info criterion	7.258673
Sum squared resid	3175.524	Schwarz criterion	7.341420
Log likelihood	-150.4321	Hannan-Quinn criter.	7.289003
F-statistic	0.000823	Durbin-Watson stat	2.762811
Prob(F-statistic)	0.977260		

2. KPSS: LGDP at levels

Null Hypothesis: LOG_GDP is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.218692
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.027901
HAC corrected variance (Bartlett kernel)	0.131779

KPSS Test Equation
Dependent Variable: LOG_GDP
Method: Least Squares
Date: 08/12/14 Time: 22:47
Sample: 1971 2013
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	9.821897	0.051276	191.5498	0.0000
@TREND("1971")	0.132330	0.002102	62.95116	0.0000

R-squared	0.989760	Mean dependent var	12.60083
Adjusted R-squared	0.989510	S.D. dependent var	1.670183
S.E. of regression	0.171061	Akaike info criterion	-0.648204
Sum squared resid	1.199730	Schwarz criterion	-0.566287
Log likelihood	15.93638	Hannan-Quinn criter.	-0.617995
F-statistic	3962.848	Durbin-Watson stat	0.060255
Prob(F-statistic)	0.000000		

2.b) KPSS: LGDP at the 1st difference

Null Hypothesis: D(LOG_GDP) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.098993
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.001053
HAC corrected variance (Bartlett kernel)	0.000697

KPSS Test Equation
Dependent Variable: D(LOG_GDP)
Method: Least Squares
Date: 08/12/14 Time: 22:54
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.176153	0.010450	16.85691	0.0000
@TREND("1971")	-0.002126	0.000423	-5.021721	0.0000

R-squared	0.386669	Mean dependent var	0.130440
Adjusted R-squared	0.371336	S.D. dependent var	0.041946
S.E. of regression	0.033259	Akaike info criterion	-3.922560
Sum squared resid	0.044245	Schwarz criterion	-3.839814
Log likelihood	84.37376	Hannan-Quinn criter.	-3.892230
F-statistic	25.21769	Durbin-Watson stat	1.554407
Prob(F-statistic)	0.000011		

3. KPSS: LMCAP at levels

Null Hypothesis: LOG_MCAP is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.118885

Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.118885
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.218808
HAC corrected variance (Bartlett kernel)	0.590037

KPSS Test Equation
Dependent Variable: LOG_MCAP
Method: Least Squares
Date: 08/12/14 Time: 22:48
Sample: 1971 2013
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.796637	0.143594	40.36810	0.0000
@TREND("1971")	0.237294	0.005887	40.30944	0.0000

R-squared	0.975388	Mean dependent var	10.77980
Adjusted R-squared	0.974788	S.D. dependent var	3.016944
S.E. of regression	0.479042	Akaike info criterion	1.411340
Sum squared resid	9.408744	Schwarz criterion	1.493256
Log likelihood	-28.34380	Hannan-Quinn criter.	1.441548
F-statistic	1624.851	Durbin-Watson stat	0.528924
Prob(F-statistic)	0.000000		

3.b) KPSS: LMCAP at the 1st difference

Null Hypothesis: D(LOG_MCAP) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.115847
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.117783
HAC corrected variance (Bartlett kernel)	0.069065

KPSS Test Equation
Dependent Variable: D(LOG_MCAP)
Method: Least Squares
Date: 08/12/14 Time: 22:55

Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.212008	0.110495	1.918701	0.0622
@TREND("1971")	-5.84E-05	0.004477	-0.013052	0.9897

R-squared	0.000004	Mean dependent var	0.210751
Adjusted R-squared	-0.024996	S.D. dependent var	0.347357
S.E. of regression	0.351671	Akaike info criterion	0.794207
Sum squared resid	4.946903	Schwarz criterion	0.876953
Log likelihood	-14.67835	Hannan-Quinn criter.	0.824537
F-statistic	0.000170	Durbin-Watson stat	1.985719
Prob(F-statistic)	0.989651		

4.a) KPSS: LVLT at levels

Null Hypothesis: LOG_VLT is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.112445
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.297790
HAC corrected variance (Bartlett kernel)	0.987179

KPSS Test Equation
Dependent Variable: LOG_VLT
Method: Least Squares
Date: 08/12/14 Time: 22:49
Sample: 1971 2013
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.179554	0.167518	30.91939	0.0000
@TREND("1971")	0.160660	0.006868	23.39400	0.0000

R-squared	0.930305	Mean dependent var	8.553412
Adjusted R-squared	0.928605	S.D. dependent var	2.091533
S.E. of regression	0.558853	Akaike info criterion	1.719535
Sum squared resid	12.80498	Schwarz criterion	1.801451
Log likelihood	-34.96999	Hannan-Quinn criter.	1.749743
F-statistic	547.2791	Durbin-Watson stat	0.297640
Prob(F-statistic)	0.000000		

4.b) KPSS: LVLT at the 1^{st} difference

Null Hypothesis: D(LOG_VLT) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.133552
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.089429
HAC corrected variance (Bartlett kernel)	0.089429

KPSS Test Equation
Dependent Variable: D(LOG_VLT)
Method: Least Squares
Date: 08/12/14 Time: 22:56
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.148471	0.096281	1.542057	0.1309
@TREND("1971")	-0.001019	0.003901	-0.261241	0.7952

R-squared	0.001703	Mean dependent var	0.126561
Adjusted R-squared	-0.023254	S.D. dependent var	0.302930
S.E. of regression	0.306432	Akaike info criterion	0.518809
Sum squared resid	3.756033	Schwarz criterion	0.601555
Log likelihood	-8.894988	Hannan-Quinn criter.	0.549139
F-statistic	0.068247	Durbin-Watson stat	1.705617
Prob(F-statistic)	0.795247		

Appendix 4: Heteroskedasticity Test: White

F-statistic	1.036617	Prob. F(9,33)	0.4329
Obs*R-squared	9.477320	Prob. Chi-Square(9)	0.3944
Scaled explained SS	7.876964	Prob. Chi-Square(9)	0.5466

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/07/14 Time: 19:32
Sample: 1971 2013
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.516337	1.086287	0.475323	0.6377
LOG_MCAP^2	0.015224	0.101465	0.150044	0.8816
LOG_MCAP*LOG_VLT	-0.024073	0.283861	-0.084805	0.9329
LOG_MCAP*LOG_EXCHR	-0.007324	0.015875	-0.461358	0.6476
LOG_MCAP	-0.039149	0.397637	-0.098455	0.9222
LOG_VLT^2	-0.002048	0.201918	-0.010141	0.9920
LOG_VLT*LOG_EXCHR	0.018335	0.028669	0.639516	0.5269
LOG_VLT	0.074075	0.663430	0.111654	0.9118
LOG_EXCHR^2	-0.000793	0.000804	-0.986104	0.3313
LOG_EXCHR	-0.071606	0.071339	-1.003739	0.3228

R-squared	0.220403	Mean dependent var	0.080693
Adjusted R-squared	0.007785	S.D. dependent var	0.116065
S.E. of regression	0.115613	Akaike info criterion	-1.276720
Sum squared resid	0.441087	Schwarz criterion	-0.867139
Log likelihood	37.44948	Hannan-Quinn criter.	-1.125679
F-statistic	1.036617	Durbin-Watson stat	1.345342
Prob(F-statistic)	0.432884		

Appendix 5

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	16.43160	Prob. F(3,36)	0.0000
Obs*R-squared	24.85118	Prob. Chi-Square(3)	0.0000

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 08/07/14 Time: 19:46

Sample: 1971 2013

Included observations: 43

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_MCAP	0.010441	0.074529	0.140097	0.8894
LOG_VLT	-0.022592	0.108134	-0.208922	0.8357
LOG_EXCHR	-0.002082	0.005112	-0.407227	0.6863
C	0.098984	0.173582	0.570244	0.5721
RESID(-1)	0.848384	0.161009	5.269183	0.0000
RESID(-2)	-0.300398	0.209192	-1.435989	0.1596
RESID(-3)	0.254799	0.165598	1.538658	0.1326

R-squared	0.577934	Mean dependent var	6.66E-16
Adjusted R-squared	0.507590	S.D. dependent var	0.287427
S.E. of regression	0.201693	Akaike info criterion	-0.216236
Sum squared resid	1.464487	Schwarz criterion	0.070471
Log likelihood	11.64908	Hannan-Quinn criter.	-0.110508
F-statistic	8.215799	Durbin-Watson stat	1.597947
Prob(F-statistic)	0.000012		

Appendix 6: General Impulse Response Function

Response of LOG_GDI

Period	LOG_GDP	LOG_EXCHR	LOG_VLT	LOG_MCAP
1	0.032890	-0.001468	0.003545	0.018253
2	0.042284	-0.007494	0.006219	0.026071
3	0.039748	-0.015756	0.013553	0.030571
4	0.035658	-0.022966	0.014205	0.029459
5	0.034739	-0.027102	0.011779	0.027536
6	0.035630	-0.027484	0.007479	0.025245
7	0.036911	-0.028964	0.004598	0.024299
8	0.037537	-0.031085	0.002461	0.023241
9	0.038013	-0.032875	0.000499	0.022264
10	0.038690	-0.034377	-0.001248	0.021619

Response of LOG_EXCHR:

Period	LOG_GDP	LOG_EXCHR	LOG_VLT	LOG_MCAP
1	-0.308249	6.906435	-2.006673	-2.015245
2	0.418851	2.899693	0.170941	0.671807
3	-0.197751	1.992632	0.627098	-0.103099
4	-0.259870	2.868544	-0.019079	-0.375537
5	0.347570	3.338951	0.262951	0.294205
6	0.101707	2.110140	0.439691	0.306956
7	-0.187311	2.091814	0.296478	-0.095711
8	-0.016881	2.702000	-0.033299	-0.157363
9	0.167445	2.460400	0.070570	0.077195
10	0.040592	2.120862	0.070724	-0.043234

Response of LOG_VLT:

Period	LOG_GDP	LOG_EXCHR	LOG_VLT	LOG_MCAP
1	0.029460	-0.079413	0.273318	0.219656
2	-0.027928	-0.166357	0.330007	0.237771
3	-0.071846	-0.272090	0.376053	0.246608
4	-0.086176	-0.205616	0.328033	0.199487
5	-0.067773	-0.189667	0.315834	0.211455
6	-0.067493	-0.201462	0.317855	0.208817
7	-0.075265	-0.201364	0.312741	0.198390
8	-0.069956	-0.181285	0.310903	0.200280
9	-0.066078	-0.185160	0.315868	0.207827
10	-0.069807	-0.193749	0.320759	0.207625

Response of LOG_MCAP:

Period	LOG_GDP	LOG_EXCHR	LOG_VLT	LOG_MCAP
1	0.168809	-0.088758	0.244460	0.304181
2	0.111617	-0.176640	0.277704	0.299436
3	0.029773	-0.285489	0.313130	0.278764
4	0.015363	-0.178040	0.254980	0.222695
5	0.043796	-0.163242	0.244196	0.244397
6	0.042837	-0.182583	0.253156	0.242612
7	0.032143	-0.173533	0.247343	0.229261
8	0.040057	-0.146716	0.249522	0.236453
9	0.042925	-0.154480	0.259259	0.246737
10	0.036287	-0.162965	0.266284	0.245409

APPENDIX 7: VECM

Vector Error Correction Estimates
Date: 08/12/14 Time: 22:57
Sample (adjusted): 1974 2013
Included observations: 40 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOG_GDP(-1)	1.000000
LOG_EXCHR(-1)	0.108990 (0.07303) [1.49233]
LOG_VLT(-1)	0.907756 (0.98206) [0.92433]
LOG_MCAP(-1)	-0.587326 (0.69380) [-0.84653]
C	-15.41929

Error Correction:	D(LOG_GDP)	D(LOG_EXCHR)	D(LOG_VLT)	D(LOG_MCAP)
CointEq1	-0.012465 (0.00451) [-2.76448]	-0.350802 (0.94687) [-0.37049]	-0.029515 (0.03747) [-0.78766]	-0.016705 (0.04170) [-0.40057]
D(LOG_GDP(-1))	0.171990 (0.23830) [0.72175]	-43.03842 (50.0395) [-0.86009]	-1.799309 (1.98029) [-0.90861]	-1.092170 (2.20390) [-0.49556]
D(LOG_GDP(-2))	-0.141722 (0.21502) [-0.65911]	63.63944 (45.1518) [1.40945]	-0.283642 (1.78686) [-0.15874]	-1.296091 (1.98863) [-0.65175]
D(LOG_EXCHR(-1))	0.000615 (0.00078) [0.78428]	-0.461804 (0.16478) [-2.80261]	-0.008155 (0.00652) [-1.25057]	-0.011137 (0.00726) [-1.53455]
D(LOG_EXCHR(-2))	0.000219 (0.00071) [0.30776]	-0.331780 (0.14939) [-2.22085]	-0.017616 (0.00591) [-2.97963]	-0.022200 (0.00658) [-3.37403]
D(LOG_VLT(-1))	-0.010612 (0.04352) [-0.24385]	-6.480851 (9.13825) [-0.70920]	0.206411 (0.36164) [0.57076]	0.218782 (0.40248) [0.54359]
D(LOG_VLT(-2))	0.032722 (0.04126) [0.79312]	13.70430 (8.66364) [1.58182]	0.179293 (0.34286) [0.52293]	0.247980 (0.38157) [0.64989]
D(LOG_MCAP(-1))	0.019719 (0.04213) [0.46803]	12.82838 (8.84704) [1.45002]	-0.053090 (0.35012) [-0.15164]	-0.191756 (0.38965) [-0.49212]

D(LOG_MCAP(-2))	-0.002090	-12.52819	-0.081433	-0.198260
	(0.03797)	(7.97391)	(0.31556)	(0.35120)
	[-0.05503]	[-1.57115]	[-0.25806]	[-0.56453]
C	0.117734	-3.345204	0.383046	0.549685
	(0.03304)	(6.93837)	(0.27458)	(0.30559)
	[3.56319]	[-0.48213]	[1.39501]	[1.79878]
R-squared	0.501502	0.414930	0.356861	0.405488
Adj. R-squared	0.351953	0.239410	0.163919	0.227134
Sum sq. resids	0.032452	1430.965	2.241087	2.775787
S.E. equation	0.032890	6.906435	0.273318	0.304181
F-statistic	3.353426	2.363995	1.849577	2.273507
Log likelihood	85.57999	-128.3020	0.880824	-3.398640
Akaike AIC	-3.778999	6.915102	0.455959	0.669932
Schwarz SC	-3.356780	7.337322	0.878179	1.092152
Mean dependent	0.128614	0.093027	0.120862	0.201300
S.D. dependent	0.040856	7.919148	0.298913	0.346004

Determinant resid covariance (dof adj.)	4.17E-05
Determinant resid covariance	1.32E-05
Log likelihood	-2.318535
Akaike information criterion	2.315927
Schwarz criterion	4.173694

APPENDIX: 8 Ramsey RESET Test

Ramsey RESET Test
Equation: UNTITLED
Specification: LOG_GDP LOG_EXCHR LOG_VLT LOG_MCAP C
Omitted Variables: Powers of fitted values from 2 to 4

	Value	df	Probability
F-statistic	11.59336	(3, 36)	0.0000
Likelihood ratio	29.07052	3	0.0000

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	1.705003	3	0.568334
Restricted SSR	3.469810	39	0.088969
Unrestricted SSR	1.764807	36	0.049022

LR test summary:

	Value	df
Restricted LogL	-6.896700	39
Unrestricted LogL	7.638560	36

Unrestricted Test Equation:
Dependent Variable: LOG_GDP
Method: Least Squares
Date: 08/14/14 Time: 17:37
Sample: 1971 2013
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXCHR	-0.922024	0.734843	-1.254723	0.2177
LOG_VLT	53.84169	43.27027	1.244311	0.2214
LOG_MCAP	-87.45610	70.14163	-1.246850	0.2205
C	-401.6698	325.3426	-1.234606	0.2250
FITTED^2	11.38067	9.130883	1.246393	0.2207
FITTED^3	-0.594237	0.487344	-1.219339	0.2306
FITTED^4	0.011470	0.009705	1.181938	0.2450

R-squared	0.984937	Mean dependent var	12.60083
Adjusted R-squared	0.982426	S.D. dependent var	1.670183
S.E. of regression	0.221410	Akaike info criterion	-0.029700
Sum squared resid	1.764807	Schwarz criterion	0.257007
Log likelihood	7.638560	Hannan-Quinn criter.	0.076028
F-statistic	392.3192	Durbin-Watson stat	1.054576
Prob(F-statistic)	0.000000		

APPENDIX: 9 Johansen Cointegration

Date: 09/09/14 Time: 19:15
Sample (adjusted): 1975 2013
Included observations: 39 after adjustments
Trend assumption: Linear deterministic trend
Series: LOG_GDP LOG_MCAP LOG_VLT LOG_EXCHR
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.579794	79.79452	47.85613	0.0000
At most 1 *	0.516822	45.98113	29.79707	0.0003
At most 2 *	0.314574	17.61371	15.49471	0.0236
At most 3	0.071253	2.882819	3.841466	0.0895

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.579794	33.81339	27.58434	0.0069
At most 1 *	0.516822	28.36742	21.13162	0.0040
At most 2 *	0.314574	14.73089	14.26460	0.0422
At most 3	0.071253	2.882819	3.841466	0.0895

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LOG_GDP	LOG_MCAP	LOG_VLT	LOG_EXCHR
-0.183608	0.694385	-0.206141	0.279622
-2.659205	1.716162	0.201672	-0.185240
5.160968	-5.879230	5.139261	-0.254776
0.534341	2.481408	-3.626639	-0.060941

Unrestricted Adjustment Coefficients (alpha):

D(LOG_GDP)	-0.013444	-0.009759	0.002510	-0.005367
D(LOG_MCAP)	-0.066089	-0.164958	0.042884	0.006704
D(LOG_VLT)	-0.085904	-0.113298	-0.005097	0.033646
D(LOG_EXCHR)	-1.903962	2.954033	1.906561	0.102155

1 Cointegrating Equation(s): Log likelihood 9.576100

Normalized cointegrating coefficients (standard error in parentheses)

LOG_GDP	LOG_MCAP	LOG_VLT	LOG_EXCHR
1.000000	-3.781896	1.122724	-1.522934
	(3.04157)	(4.40810)	(0.36743)

Adjustment coefficients (standard error in parentheses)

D(LOG_GDP)	0.002468
	(0.00100)
D(LOG_MCAP)	0.012134
	(0.00917)
D(LOG_VLT)	0.015773
	(0.00789)
D(LOG_EXCHR)	0.349582
	(0.20516)

2 Cointegrating Equation(s): Log likelihood 23.75981

Normalized cointegrating coefficients (standard error in parentheses)

LOG_GDP	LOG_MCAP	LOG_VLT	LOG_EXCHR
1.000000	0.000000	-0.322453	0.397349
		(0.23599)	(0.08056)
0.000000	1.000000	-0.382130	0.507757
		(0.33328)	(0.11377)

Adjustment coefficients (standard error in parentheses)

D(LOG_GDP)	0.028419	-0.026082
	(0.01353)	(0.00940)
D(LOG_MCAP)	0.450792	-0.328986
	(0.09985)	(0.06935)
D(LOG_VLT)	0.317056	-0.254089
	(0.09731)	(0.06759)
D(LOG_EXCHR)	-7.505798	3.747516
	(2.52803)	(1.75582)

3 Cointegrating Equation(s): Log likelihood 31.12526

Normalized cointegrating coefficients (standard error in parentheses)

LOG_GDP	LOG_MCAP	LOG_VLT	LOG_EXCHR
1.000000	0.000000	0.000000	0.445449
			(0.09541)
0.000000	1.000000	0.000000	0.564759
			(0.13535)
0.000000	0.000000	1.000000	0.149170
			(0.07175)

Adjustment coefficients (standard error in parentheses)

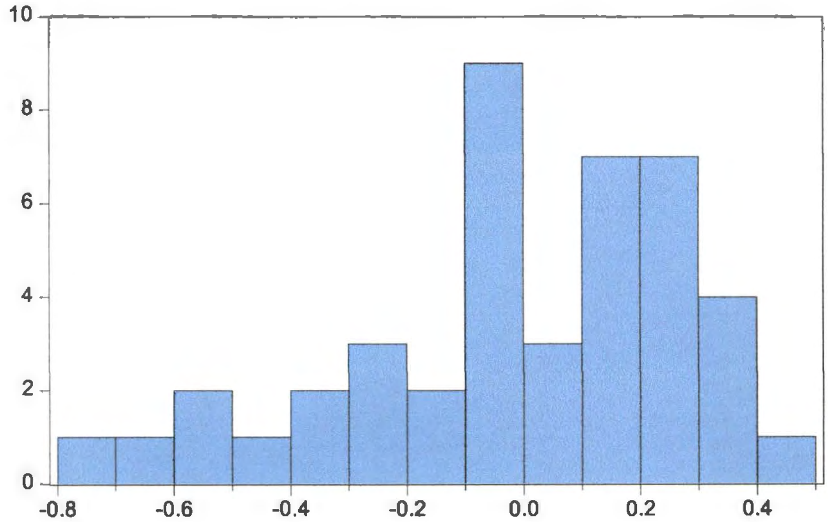
D(LOG_GDP)	0.041372	-0.040839	0.013702
	(0.02935)	(0.03114)	(0.02600)
D(LOG_MCAP)	0.672115	-0.581111	0.200748
	(0.21182)	(0.22477)	(0.18770)
D(LOG_VLT)	0.290752	-0.224124	-0.031334
	(0.21198)	(0.22494)	(0.18784)
D(LOG_EXCHR)	2.333904	-7.461596	10.78655
	(5.04415)	(5.35256)	(4.46987)

APPENDIX 10: ENGLE GRANGER CAUSALITY

Pairwise Granger Causality Tests
Date: 08/07/14 Time: 19:57
Sample: 1971 2013
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
LOG_MCAP does not Granger Cause LOG_GDP	40	1.42832	0.2521
LOG_GDP does not Granger Cause LOG_MCAP		5.94226	0.0023
LOG_EXCHR does not Granger Cause LOG_GDP	40	0.11805	0.9489
LOG_GDP does not Granger Cause LOG_EXCHR		0.89992	0.4516
LOG_VLT does not Granger Cause LOG_GDP	40	1.25348	0.3063
LOG_GDP does not Granger Cause LOG_VLT		4.24734	0.0121
LOG_EXCHR does not Granger Cause LOG_MCAP	40	5.93907	0.0023
LOG_MCAP does not Granger Cause LOG_EXCHR		1.89172	0.1502
LOG_VLT does not Granger Cause LOG_MCAP	40	0.93604	0.4343
LOG_MCAP does not Granger Cause LOG_VLT		1.14654	0.3448
LOG_VLT does not Granger Cause LOG_EXCHR	40	1.57206	0.2147
LOG_EXCHR does not Granger Cause LOG_VLT		5.08899	0.0053

APPENDIX 11: JARQUE BERA TEST



Series: Residuals
Sample 1971 2013
Observations 43

Mean	6.66e-16
Median	0.059078
Maximum	0.446008
Minimum	-0.729345
Std. Dev.	0.287427
Skewness	-0.758891
Kurtosis	3.020743
Jarque-Bera	4.128168
Probability	0.126935