An assessment of the role of real exchange rate on economic growth in South Africa (1994 – 2015)

By

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DECLARATION

I, the undersigned **Muzekenyi Mike, student number 11618348,** hereby declare that this research paper is my own original work. The study has not been submitted and will not be presented by any other student at this institution or at any other university for a similar or any other degree award in or outside South Africa. All information derived from the published or unpublished work of other authors has been acknowledged both in the text and in the reference list section.

ACKNOWLEDGEMENTS

First and foremost, to God, be all the glory and honor for blessing the efforts made in this study, for his bountiful mercies upon my life shall forever be glorified.

The collaborative effort of team players whose relentless efforts have been brought to bear the success of the study. To my supervisors, Mr G. Dafuleya head of department and Prof. A.B. Gyekye may God richly bless your lives. All valuable suggestions, supervision, discussions and guidance were so helpful throughout the entire study. I am so grateful for working with you though the journey was not easy.

To the late Mr U. Masunda and my mother R. Zulu, may your souls rest in peace. Thank you for the support you showed me. You shall forever be missed and remembered for all you did in my life. The opportunity of receiving formal education up to this level is considered a blessing, which has been made possible through big-heartedness of my parents and friends.

My siblings Forget Phiri, Simbarashe Muzekenyi, and Emily Taruvinga thank you very much for your tireless effort, time and support from the concept of life to the very end of this study. May God richly bless you now and forever more.

DEDICATION

The road to success is graced with people who leave permanent footprints in one's life. It's inevitable that one loses touch with some of the most admirable people as one goes through life. This study is therefore dedicated to my late mother who through one way or another left that indelible footprint in my life, which has made me who I am today. My hope is that this study may serve as a motivation for future research.

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ABBREVIATIONS

ADF	Augmented Dicky Fuller
ARIMA	Autoregressive Moving Average
ADB	Asian Development Bank
COSATU	Congress of South Africa Trade Union
DW	Durbin – Watson
EMU	European Monetary Unit
FCF	Fixed Capital Formation
FDI	Foreign Direction investment
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GEAR	Growth Employment and Redistribution Policy
GDP	Gross Domestic Product
GLS	Generalized Least Squares
GMM	Generalized Methods of Moments
JB	Jarque Bera
IRF	Impulse Response Function
MPA	Monetary Policy Authorities
LM	Lagrangian Multiplier
LDC	Less Developed Countries
OLS	Ordinary Least Squares
OP	Trade openness
PP	Phillips-Perron
REER	Real Effective Exchange Rates
RER	Real Exchange Rate
SA	South Africa
SARB	South African Reserve Bank
USA	United States of America
VAR	Vector Auto-Regression
VD	Variance Decomposition
VEC	Vector Error Correction
VECM	Vector Error Correction Mechanism
ZAR	Zuid-Afrikaans Rand (South African Rand)

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ABSTRACT

The choice of a weak or strong currency has been at the center of the debate in most developing economies as exchange rates play a vital role in a country's level of economic growth. This growth is critical to many developing economies. The study assessed the role of real exchange rate on economic growth in South Africa from 1994, first quarter, to 2015, fourth quarter. The study used time-series data in which Augmented Dicky Fuller and Philip Perron tests for stationarity, cointegration test, Vector Error Correction Model (VECM) approach for the long-run relationship were conducted. Impulse Response Function (IRF) and Variance Decomposition (VD) were also conducted to explain the response to shock amongst variables and how much of the forecasting error variance is explained by the exogenous shocks to other variables. VECM results showed a positive role exchange rates play on economic growth in South Africa. The study's implication is that currency devaluation (exchange rates depreciation) can be effective in improving economic growth in the short-run. Nonetheless, a strong currency is good for economic growth in the long-run as it attracts foreign investments and a good instrument for controlling inflation. Thus, basing on the findings of the study, the floating exchange rate system adopted by South Africa in 2000 can be maintained.

Keywords: South Africa, Exchange rates, Economic growth, Vector Error Correction Model.

CHAPTER 1

1. Introduction

1.1. Background to the study

Despite periods of seemingly improved trade and economic growth in Africa, the continent is lagging behind in trade competitiveness on a global scale as exchange rate movements variability intensify (M&T Bank, 2016). Africa is regarded as one of the leading exporting and importing continents in the world (International Monetary fund, 2016). Regardless of the fact that African trade is dominated by diverse natural resources that the continent enjoys in abundance, many African countries are caught up by the ever increase of exchange rate movements variability (MTB, 2016). With the African continent taking a rough ride due to exchange rate movements' variability, a huge and growing volume of academic and policy work is a testimony to the pervasiveness and the complexity of the debate on which exchange rate level is regarded as competitive (Essers, 2016). This debate on how low or high exchange rates can be used to improve trade competitiveness on a global scale predominantly in developing economies is still an ongoing concern in the African continent (European Parliamentary Research Service, 2016). The question why such a competitive advantage has not been effective in improving the continent's competitiveness and contribute to a sustainable economic growth remains unanswered in international finance. Khan (2015) argues that proponents of neither weak nor strong currency claim that exchange rates play a crucial role in trade competitiveness on both exporting and importing economies for a sustainable growth in Africa. As such, variation is found on the level of the exchange rate to be used as either low or high exchange rate can be beneficial in an economy. For instance, MTB (2016) states:

> *With a strong exchange rate (strong currency) there are many advantages such as imports become relatively cheaper and boosts local importing industries. The price for imported raw materials becomes cheaper hence the cost of production for firms becomes less. This could lead to decreased prices for consumers. The lower price of imported goods also puts pressure on domestic firms to keep prices low. All these lead to a downward pressure on inflation hence sustained growth. Furthermore, more imports can be bought as a high exchange rate means that for each unit of the currency, more units in foreign currencies can be bought. Therefore, there will be more visible imports, such as technology, and invisible imports, such as foreign travel. Moreover, a high value of currency forces domestic producers to be more efficient as they will try to retain their competitiveness. On the other hand, low exchange rates (weak currency) are good for exporting industry. Local goods and services become relatively cheap*

compared to imports. Demand for local goods and services increases so is production. The increase in demand implies an increase in production hence economic growth.

Thus, since either low or high exchange rates are significant for growth, many developing economies are faced with a puzzling task to choose from low or high exchange rates (MTB, 2016). There is no substantial evidence to support either claim. The use of either weak or strong currency as a stimulus for competitive trade remains a highly contentious issue (EPRS, 2016). The argument regarding the implementation of policies that weakens or strengthens currencies to improve the exchange rate competitiveness in the world market has divided the Monetary Policy fraternity. Habib, Mileva, and Stracca (2016) claim that finding an answer to a prominent weak or strong currency debate would have far-reaching implications on trade as stimuli for economic growth. Thus, the debate on policy implementation to weaken or strengthen currencies under floating exchange rate regime stands to be a grim task in monetary policy fraternity. Dani (2007) posits that economists around the globe have long discovered that poorly managed exchange rates can be disastrous for economic growth.

Thus far, there is division in the Monetary Policy fraternity regarding policy implementation to weaken or strengthen currencies. Two strands arise, some Monetary Policy Authorities (MPA) are advocating policies that weaken the currency as a stimulus for economic growth as it boosts the exporting industry (Jakob, 2016). On the other hand, other MPA claims that implementing policies for a strong currency help in the balance of payments discrepancies and a good instrument for lower inflation (Habib, et al., 2016). In light of this, governments in countries which adopted floating exchange rate regimes are puzzled as to which decision to implement when it comes to a stronger or weaker currency. Thus, Habib, et al., (2016) claim that reaching a rational decision to a prominent weak or strong currency debate would have far reaching implications on the design of exchange rate policies as instruments for economic growth.

Empirically, it has been speculated that the maintenance of weak currency in developing economies is good for medium-term growth (Bhoola, 2016). Ohuche (2014) states that exchange rate devaluation is a strategy mostly used by infant economies to stimulate economic growth as it boosts exports. Since exports form part of production capacity of a country an increase in demand for domestic goods and services due to a low exchange rate the balance of payments (Akpan and Atan, 2012: Habib, et al., 2016). In addition, Gibley (2016) argues that export-led economies can gain a bigger market share in the international market as their goods would be cheaper relative to economies with high exchange rates. From this view, some monetary authorities in developing nations are enticed to advocate for a low exchange rate as an instrument for economic growth.

Contrary to a weak currency, other MPAs in developing economies are advocating a high exchange rate as they believe that it is good for controlling inflation. In the long-run, it is a good instrument for the balance of payments disequilibrium and attracting foreign investments (Gibley, 2016). A high exchange rate (strong currency) makes imported raw materials cheaper thus, lowers prices charged on goods and services produced and sold locally. Economical goods induce more consumption and increase in consumption accelerates total produce thus, economic growth increases. Druck, Magud and Mariscal (2015) postulate that a strong currency can serve as a good instrument for keeping inflation rate low. The logic behind the strong currency is that it lowers the cost of imported goods and enables lower prices in the domestic market (Lerven, 2016). In support of this, Pettinger (2015) argues that a strong currency can have far-reaching economic benefits in developing economies both in trade and investments. Another reason for having a stronger currency is that it enables the central bank to retain autonomy in achieving government objectives (Benlialper and Comert, 2016). Sibanda (2012) observes that the South African government undertook the relaxation of exchange controls to aid the lowering of inflation through the implementation of Growth, Employment and Redistribution Policy (GEAR). Thus far, countries with strong currencies are regarded as very competitive in the international trade and in the domestic financial affairs (Bhoola, 2016).

Consequently, the debate for a strong or weak currency was strengthened by the global financial crisis of 2008 especially in economies operating under floating exchange rate regimes (Benlialper and Comert, 2016). The global financial crisis in 2008 caused a division in international finance as other currencies became stronger at the expense of other others (Shah, 2013). Thus, the financial crisis influenced a pool of Monetary Policy Authorities mostly in African economies to push for strong currencies (Industrial Development Corporation, 2016). Countries like Botswana, Egypt, Morocco, Zambia, and Mozambique managed to reform their monetary policies for strong currencies (IMF, 2016). Soon after the global crisis, currency appreciation became a norm in these countries as a way to lower inflation, improve economic growth and correcting the balance of payments imbalances (Africa Development Bank, 2014). On the other hand, currency depreciation occurred in Zimbabwe, Nigeria, South Africa, and Rwanda due to political unrest and external influence from developed nations (Organization for Economic Cooperation and Development, 2002). Weak currencies in these countries caused major capital outflows and increased trade imbalances which in turn instigated a further sharp currency depreciation, inflationary induced prices and weak growth (IDC, 2016; Gibley, 2016).

Economic growth in sub-Saharan African countries is less optimistic. The growth projections for the region due to weak currencies have been very low as anticipated by IMF projections in the beginning of 2016 (IMF, 2016). An average of 0.7% increase in growth between 2015 and 2016 is regarded as undergrowth in the sub-Saharan region as compared to the projections from IMF (IDC, 2016). Regardless of such undergrowth in the region, some economies are reaping economic benefits of strong currencies in developed nations such as China and Australia (Pettinger, 2014). China is one of the economically fast-growing nations in the world despite its stronger currency compared to its trading counterparts such as South Africa, India, and Japan (Gurria, 2012). Thus far, the debate on weak or strong currency remains a major economic challenge in developing countries and there is no substantial evidence for either claim.

As a result, Goldsmith (2010), MacBean (2009), Adom, Morshed and Sharma (2012) have all suggested the need to adequately examine the effect of weak or strong exchange rate on economic growth. In light of this, different studies have been conducted in order to demonstrate the adverse effects associated with a strong or weak exchange rate and economic growth. However, many empirical studies present opposing views on the effect exchange rates on economic growth in macroeconomics. Several authors reveal ambivalent and inconsistent empirical evidence in this area. Studies in this field can be categorized into three main result areas. Firstly, many studies such as by Khondker, Bidisha and Razzaque (2012), Jakob (2016) and Tarawalie (2010) have found a positive relationship between real exchange rate and growth. Other studies such as McPherson and Rakovski, (2000) show that real exchange rate has no effect on economic growth. Lastly, other studies by Munthali, Simwaka and Mwale (2010), Wan (2012) and Kennedy (2008), conclude that real exchange rate negatively affects economic growth.

Considering this, this study aims to investigate the role of exchange rate on economic growth in the South African economy. This is because there is no clear and comprehensive understanding on whether to advocate for the low or high exchange rate in developing economies. Habib, et al., (2016) observe that the persistent debate among various economic agencies and politicians on maintaining a weak or strong currency is fast becoming a major concern that needs immediate resolution. Therefore, it is important to further assess the role of exchange rate on economic growth in developing economies using South Africa as a point of reference. South Africa provides an interesting case study because although it is seen as the most developed economy in Africa, the country relies on international trade for sustainable economic growth and its exchange rate inconsistency.

1.2. Statement of the problem

One major primary objective of the South African Reserve Bank (SARB) in the forex market is to maintain exchange rate competitiveness in the interest of sustainable and balanced economic growth (SARB, 2016). With the adoption of an explicit flexible exchange rate policy framework in 2000, the SARB recognizes that by guaranteeing a competitive exchange rate, monetary policy fulfills an important precondition for the attainment of economic growth in the short-run and long-run. However, economic growth and exchange rate in South Africa have been relatively unpredictable and correlated to the global economic performance (IDC, 2013). For instance, the East Asian crisis in 1998 and global financial crisis in 2008 presented a more dramatic and daunting downturn for the South African economy. The economy was heavily affected by external crises due to economic global integration (OBC, 2016). In the past decade, the South African economy has been concurrently adjusting to its economic reintegration in the world economy. Substantial trade liberalization and structural adjustments have been a daunting task in the South African economy (IDC, 2013).

Thus far, South Africa's global integration left the SARB faced with a critical task to maintain exchange rate competitiveness (SARB, 2013). There are mixed views between weak or strong currency as a driver of economic growth via international trade and attracting foreign investments. Projections from international accredited institutions such as IMF predicted an increase in growth by 1.4% by the end of 2015 due to a weak currency. The World Bank expected growth to increase by 2% due to well a managed financial market and weak currency which would increase investments. On the other hand, the SARB estimated a total of 1.5% increase in growth due to The Reconstruction and Development Programme (RDP) programs instigated by the government (IDC, 2016). Nonetheless, the economy recorded an annual increase of 0.7% much lower than the expected rates and the Rand was trading at R15.6/USD, the weakest rate in the past two decades during the second quarter of 2015. The USD/ZAR rate reached its highest rate of R16.89 and net exports fell by 11.1% during the fourth quarter in 2015 (SARB, 2016; Trading Economics, 2016). As such, the MPAs in South Arica are finding it difficult to reach a rational decision regarding weak or strong currency. Furthermore, the exchange rate in South Africa is determined by the market forces and a massive drop in investments due to political unrest further weakened the currency inter alia sluggish growth in the past four years (SARB, 2016).

However, even though the SARB implemented the new monetary policy stances in the year 2000, ever since, the economy has been experiencing fluctuating growth. This contradicts SARB objectives of the competitive exchange rate, low inflation, employment creation and sustainable economic growth. Considering this, it is clear that it is becoming a challenging task for the MPAs to enhance exchange rate competitiveness and improved economic growth. Now, other MPAs are advocating for a weak currency to boost exports yet others are claiming that a strong currency is good for the low levels of inflation, investments and correcting the balance of payments.

Therefore, the decision on whether to implement policies for a weak currency in favor of exporting industries or a stronger currency in favor of investments is a challenging task in the economy. Since South Africa is an open economy, exchange rates are a very crucial variable for economic growth, trade balances, competitiveness and attracting foreign investments. Given the importance of exchange rates on economic growth and the policy implications in determining factors that enhance or deter exchange rates competitiveness, it is worrying that there are contradicting findings regarding the specific effect of exchange rates on economic growth in several studies.

1.3. Research Question

- Does REAL EXCHANGE RATE have a significant effect on the South African economic growth in the short and long-run?

1.4. Objectives of the study

The main objective of the study is to assess the role of the real exchange rate on economic growth in the short and long-run in South Africa between 1994: Q1 and 2015: Q4. The specific objectives of the study are:

a) To provide a review of trends in real exchange rates and economic growth in South Africa between 1994: Q1 and 2015: Q4.

b) To analyze the role of real exchange rates on economic growth in South Africa in the long-run between 1994: Q1 and 2015: Q4.

1.5. Hypotheses of the study

Below are the study's hypotheses:

Real Exchange rates and Economic growth

- **H_o**: Real exchange rates have no statistical significant effect on economic growth in the long-run in South Africa.

- **H_1**: Real exchange rates have a statistical significant effect on economic growth in the long-run in South Africa.

1.6. Significance of the study

According to Hodge (2005), exchange rates management is an important aspect for economic growth as they affect trade and investments. Depreciating or appreciating exchange rate can either negatively or positively affect the economy depending on the demand and supply responsiveness (Bronkhorst, 2012). Statistics South Africa (2015) reported that the South African Rand continues to depreciate against other currencies such as the US dollar on the international level. Therefore, this emphasizes the importance of examining the role of exchange rates on economic growth in South Africa. The study will add information on the existing empirical literature regarding the role of exchange rates on economic growth in South Africa. Furthermore, the results of the study may contribute towards policy planning and implementation at all levels of government, including the banking sector and the business community. Finally, the study hopes to fill the gap in the literature by providing a far-reaching trend analysis on the true relationship between real exchange rate and economic growth in South Africa.

1.7. Organization of the study

Chapter 1: Background to the study: This chapter introduces the study and presents the statement of the problem, objectives, and hypotheses.

Chapter 2: Trend Analysis: This chapter provides a trend on real exchange rate management and economic growth in South between 1994 and 2015.

Chapter 3: Literature Review: a Literature review on the subject is carried out in this chapter. Both theoretical and empirical literature are reviewed.

Chapter 4: Research Methodology: The chapter outlines the methodology followed in the study. The empirical model specification is outlined and the data, procedures followed. (The chapter also covers the presentation, interpretation, and analysis of the results).

Chapter 5: Data analysis and results presentation: All statistical analyses are conducted in this chapter and the results are also interpreted.

Chapter 6: Summary, Conclusion and Policy recommendations: This chapter provides a closure to the study by giving a summary, concluding remarks and recommendations for policy makers.

1.8. Chapter summary

This chapter outlined the introduction covering the background of the study which presented the international debate between weak and strong currency. The chapter noted that unstable exchange rates and sluggish economic growth are experienced by many developing economies. After the background of the study discussion, the problem statement was derived and necessitated the formulation of the research question on which objectives of the study were based. Research hypotheses and organization of the study were outlined in this section. The chapter focused on answering the research questions guided by the objectives of the study. The research problem and the significance of the study were also outlined.

CHAPTER 2

2. ECONOMIC GROWTH AND EXCHANGE RATES TREND ANALYSIS

2.1. Introduction

This chapter provides a contextual trend analysis of economic growth and exchange rate system in South Africa from 1994 to 2015. Firstly, the background information on Economic Growth in South Africa is covered in this chapter. Second, exchange rate management in South Africa is discussed and finally, Gross Domestic Product and real exchange rate movements are then discussed. The chapter begins with a discussion of the background information on Economic Growth in South Africa.

2.2. Background information on Economic Growth in South Africa

The diverse structure of the South African economy is in a critical phase of its historic economic growth performance. The South African economy recorded its fastest economic growth in 1960 followed by the period of 2004 to 2007 in which the gross domestic product averaged 5.2% per annum (IDC, 2013). This favorable growth was a result of the South African Reserve Bank (SARB) closely monitoring business cycle turning points since 1946 (Bosch and Ruch, 2012). SARB used a combination of methods and closely followed all processes of identifying business cycle indicators. Subsequently, the South African economy recorded fourteen sequential years of positive real GDP growth and this phase is marked as the longest sustained growth phase in the country's modern history. This was as a result of improved trade in which most western countries such as America opened up new routes from Southern Africa to Asia and the rest of the world (World Trade Organisation, 2013). In particular, breakthroughs in transport technology led to improved trade on a global scale (WTO, 2013). Foreign trade and international investment became the norm of the century as national economies opened up to global trade. The introduction of cargo shipping enabled the movement of thousands of tons of different merchandise from Southern Africa to many corners of the world (Bosch and Ruch, 2012).

IDC (2013) also observes that from a global perspective, this period was characterized by a strong bull market and successful commodities markets. The historic transition soon after democracy restored favorable conditions for economic growth and created the possibility of more stable economic conditions which restored investor confidence and growth improvement prospects (Cookie and Susanne, 2015). Domestically, fixed investments and increased household consumption expenditure substantially elevated economic growth. According to the IDC report, in 2013, the export sector provided considerable impetus over the years 2005 to 2007.

In addition to profound transition in the exporting industry, domestic firms made noticeable substantial strides in making progress in different infrastructure development (Organisation for Economic Co-operation and Development, 2015). The government of South Africa identified small to medium enterprises (SMEs) as a key bolstering and employment. However, these SMEs faced high regulatory burdens and the pattern of social housing hindered business opportunities (OECD, 2015). Nevertheless, the government of South Africa made large investments to rectify regulatory and capacity challenges problems. Large chunks of money were channeled to the development of SMEs aiming at improving the economy. In addition, this noticeable growth from 2000 was backed by progressive entrenched macroeconomic stability supported by sound and transparent fiscal and monetary policies and programs. After democracy in 1994, South Africa under the leadership of African National Congress (ANC) was more dedicated to improving economic growth (Organization for Economic Cooperation and Development, 2002). (South African History online, 2014) states that the major aim of the new unified government was to reduce inequality, improve resource allocation and improve production as a means of stimulating economic growth.

The sustained economic growth experienced since 1994 could not have been realized without the aid of appropriate government policies, strategies, and programs focusing on growth, employment creation, and wealth distribution among South African citizens. OECD (2013) recommended that policies focused on the objectives of the National Development Plan (NDP), obstacles for job creation and investments in social and economic infrastructure led to notice an economic improvement in South Africa (SAHO, 2014). Tackling infrastructure bottlenecks and improving business regulation to support job creation in addition to investments indeed led to economic improvements in South Africa. The new government implemented different programs to rebuild and transform the economy after many years of apartheid regime's economic oppression and isolation as well financial sanctions enforced by the international community (SAHO, 2014). In this regard, the Reconstruction and Development Programme (RDP) was the pilot program implemented in 1994 as a primary socio-economic program. It was followed by the Growth, Employment and Redistribution (GEAR) in 1996, Accelerated and Shared Growth Initiative for South Africa (ASGISA) in 2005, New Growth Path (GNP) in 2010 and National Development Plan (NDP) in 2013 (SAHO, 2014). As a result, the South African economy experienced major economic transformational phases. A summary of all the programs implemented from 1994 to date is given in Table 2.1.

Table 2.1. Summary of South African Growth Programs since 1994

Program	Year	Objective
Reconstruction and Development Programme	1994	To establish equal societies through reconstruction and development as well as strengthening democracy for all South Africans.
Growth, Employment, and Redistribution (GEAR)	1996	To stimulate faster economic growth, reducing fiscal deficits, lowering inflation, maintaining exchange rate stability, decreasing barriers to trade and liberalizing capital flows.
Accelerated and Shared Growth Initiative for South Africa (ASGISA)	2005	Reduce poverty by 2010, and halving unemployment by 2014 from the 28% in 2004 to 14%.
New Growth Path (NGP)	2010	To accelerate growth in the South African economy, reduce poverty, unemployment, and inequality.
National Development Plan (NDP)	2013	To provide overarching goals for what the SA economy wants to achieve by 2030. To Build consensus on the key obstacles to achieving these goals and what needs to be done to overcome those obstacles. To provide a shared long-term strategic framework within which more detailed planning can take place to advance the long-term goals set out in the NDP. To create a basis for making choices about how best to use limited resources.

Source: SAHO (2014)

As summarized in Table 2.1, the RDP aimed at creating a strong, dynamic and balanced economy (SAHO, 2014). The program is regarded as successful in some areas such as in social security in which the government managed to establish a widespread welfare system. Hanival and Maia (2014) state that the Community Survey released in October 2007 revealed that over 88% of South Africans gained access to clean water and 64% of the population lived informal housing structures. This revealed tremendous steps taken by the government towards economic development as a major initiative to economic growth. SAHO (2014) also mentioned that the RDP is viewed as a cornerstone for government economic development policy which to a greater extent did not deliver as planned in terms of economic growth.

From 1996, GEAR was implemented with the intention to work hand in hand with the RDP (IDC, 2016). The GEAR program produced better results in 1997 as the strong spirit of reconciliation which was personified by former late President Mandela gave remarkable reconciliation and nation-building which was characterized South African economic transformation. The private sector fully supported the broad principles of GEAR such as the emphasis on the budgetary reforms and fiscal deficit reduction. Trade unions remained committed to a social compact between government, labor, and employment. However, the objectives of GEAR until its objectives were adversely affected by the East Asian crisis in 1998 (Michie and Padayachee, 1998). GEAR suffered heavily from external forces which saw foreign trade and foreign investments deteriorating and GDP growth dropping in 1998 as shown in figure 2.1. GDP growth being one major objective of the central bank did not increase as planned for the growth fell dismally during the Asian financial crisis. Inflation and sluggish growth among other challenges heavily strained the economy from 1997 until 2001 (IMF, 2016; Habib, et al., 2016).

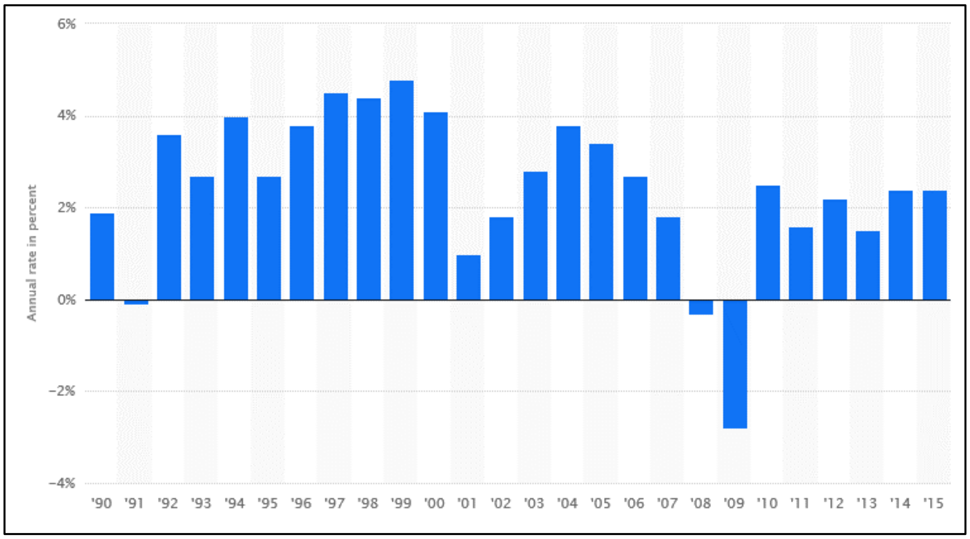
Amidst other policies, in the year 2000, the central bank changed the monetary policy regime to inflation targeting interest rate as a nominal anchor (Mtonga, 2011). This policy was aimed at combating the Asian crisis inflationary pressure which struck the economy from 2007. Gibley (2016) points out that substantial efforts were taken which saw the GDP taking a positive streak during the last quarter of 2000 and 2001. GDP increased substantially until 2004 when it took a downturn thereafter. The government, however, responded by introducing ASGISA program in 2005 due to sluggish growth and the objectives of RDP were not fully met (SAHO, 2014). The aim of ASIGISA was to increase economic growth to an average of 4.5% per annum between 2005 and 2009 and a further 6% growth between 2010 and 2014 (IDC,2016). Department of Trade and Industry (2014) later mentioned that the South African economy recorded 5.4% growth in GDP in 2006 and a moderate 5.1% in 2007. The increase in consumption that instigated high demand plus strong capital inflows reflected increased investor confidence and the extraordinary performance of the financial markets. Nevertheless, the positive growth did not last long, as the 2007-2008 global financial crisis swept across many nations around the globe. South Africa recorded a dismal negative growth in 2008 and 2009 as shown in figure 2.1. Investment in financial markets and assets prices were heavily affected as the interests rates fell abruptly (IMF, 2016). The period between 2008 – 2009 was the worst periods in terms of economic performance in South Africa and the world at large. ASIGISA program came to an end in 2010 and NGP program was launched in the same year (DTI, 2014).

The NGP program proved effective as its objectives were boosted by the 2010 soccer world cup and GDP growth increased as shown in figure 2.1 below. GDP increased at an average of 2.9% in 2010 from a negative 2.5% in the previous year (StatsSA, 2014). However, South Africas' road to a sustainable and equitable economic expansion led to the birth of a comprehensive program of the NDP in 2013 as GNP started to fade away. The NDP program aimed at improving skills development and other forms of human development which are considered be key factors of economic development (SAHO, 2014). The NDP recognizes the shortcomings of South Africa's educational system and the importance of addressing these urgently to achieve the skills development that will be needed for higher levels of growth in GDP and employment. This program is still an ongoing process as the government wants to increase skills and other forms of human capital by 2030.

The government of South Africa remained committed to a social compact between government, labor and employment organization (DTI, 2014). In addition, new tax incentives were introduced to support fixed investment and restructuring in manufacturing in order to boost competitiveness, facilitate higher labor absorption, and encourage small and medium-sized manufacturing (Habib, et al., 2016). Fixed investment and direct foreign investment manifested as concrete was in South Africa's economic growth path. Economic growth in South Africa had periods of expansion and periods contraction as shown in figure 2.1. Nonetheless, South Africa has been marked as one of the top economies that have progressed in Africa. Institute of Directors in Southern Africa (2016) reports that the country has been noted for its huge correspondence in wealth, resources, education, financial markets and economic growth since 1994. Well governed South African political setup and increased government and foreign investments guaranteed improved economic performance (Gibley, 2016). In addition, household consumption and improved infrastructure have been the chief cornerstone for economic transition. Overall consumption has contributed the largest share of GDP in South Africa (Prinsloo, 2000). In conclusion, South Africa's economic infrastructure denotes one of its most important competitive strengths. The country produces 50 percent of Africa's and 87.2 percent of Southern Africa's electricity–and its roads, railways, and telephones stand out within an African context (Gibley, 2016). All the above-mentioned developments are there for a successful economic transformation in South Africa. Below is the GDP trend from 1990 until 2015 as reported by StatsSA.

2.3. The trend in Gross Domestic Product in South Africa from 1994-2015

Figure 2.1. GDP growth in South Africa: 1994-2015.[1]

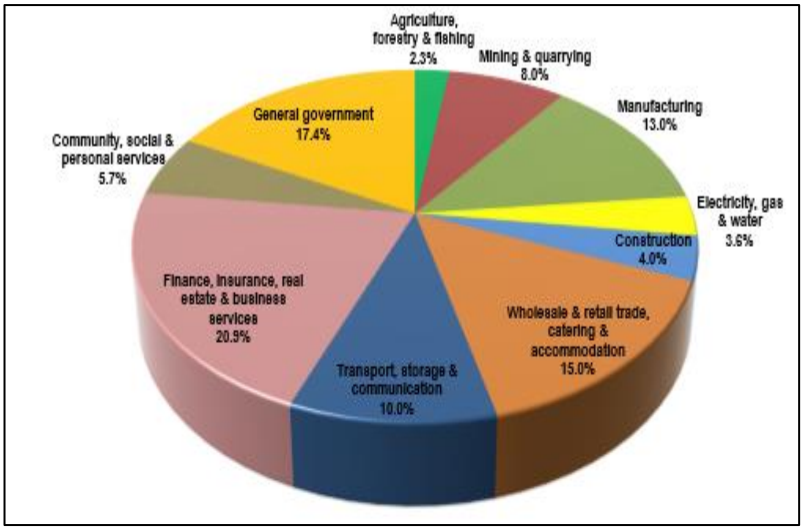


Source: StatsSA (2016)

The South African economic growth had an upward trend soon after independence in 1994 with a slight drop in 1995 and improved thereafter as shown in figure 2.1 above. Good political reforms and different government programs enhanced economic growth in the country regardless of periods of boom and bust as shown in figure 2.1. In 1994 up to 1996, the country experienced a gradual increase in economic growth. A stable political environment alongside increased foreign direct investment from 1994 guaranteed improved economic performance. As such, investor confidence was restored soon after the inception of a democracy in 1994 which created a peaceful and more stable economy (Haddock, 2013). From 1997 to 2007, GDP as a measure of economic growth increased from an average of 2.7% per annum (1997 - 2003) to 5.2% per annum (2000-2007) (StatsSA, 2014). The global economic crisis of 2008 saw a negative growth recorded in 2008 and 2009. The global economic crisis of 2008-2009, other poor ongoing economic performance around the globe, political and social challenges in South Africa strained the economy from being on the road to a sustainable and equitable economic expansion (StatsSA, 2014). Nonetheless, 2010 came as a relief as GDP growth gained its momentum and 2.9% growth rate was attained. From 2011, an annual growth rate of 3.2% was recorded. However, growth dropped to 2.2% in 2012, to 1.5% in 2013 and ended up at 1.3% in 2015 (StatsSA, 2014). Reflecting a deterioration in economic growth in South Africa, figure 2.2 summarizes all sectorial contributions on growth in South Africa in 2015.

[1] An average of 10 years per phase was used to analyze the trends in the Gross Domestic Product.

Figure 2.2. The sectorial composition of the South African economy in 2015.



Source: IDC (2016)

Total sectorial contributions in 2015 are shown in figure 2.2. Finance, Insurance, real estate & business services contributed the largest share of 20.9% in the South African economy followed 17.4% from the general government. As for the mining sector IDC (2016) states that, although the mining sector's GDP expanded by 3%, this was largely due to the very low base recorded in 2014, when it experienced a 5-month long strike. Nonetheless, the sector is still being affected by low conditions in commodity markets (IDC 2016). As for the agricultural sector, the worst drought conditions in the 2014-2015 farming season resulted in agricultural production declining by 8.4% in 2015. Thus,

Agricultural, forestry, and fishing recorded the lowest composition of 2.3% in 2015 as shown in figure 2.2. As for the manufacturing sector, a weak activity in the primary sectors impacted negatively on this sector, and the sector virtually recorded no growth for the second consecutive year (IDC, 2016). However, the finance and business services sector recorded the highest growth rate of 20.9% in 2015. Consequently, a substantial growth was noticed in other sectors such as the general government (17.4%), the wholesale & retail trade, catering & and accommodation (15%) and transport, storage & communication (10%).

However, despite periods of seemingly low growth in South Africa, the economy experienced noticeable growth during different periods such as 1999 and 2004 as shown in figure 2.1**.** Prior to 2015, the growth path followed the typical development path, with the leading sectors changing from agriculture, to mining, to manufacturing and then services (Natrass and Seekings, 2010). Within the economy, aggregate expenditure contributed the largest economic growth over the period 1994 – 2015 (IDC, 2016). Total household spending contributed close to 74.8% to overall economic growth, fixed investment contributed a total of 29.3% and government expenditure contributed a total of 18.2% (IMF, 2016). In conclusion, the structure of the economy and sector performance in South Africa has changed considerably over time. There are periods of improved economic growth and periods of sluggish growth as shown in figure 2.1. A more detailed discussion on the exchange rate management in South Africa is presented follow.

2.4. Exchange rate management in South Africa

South Africa's exchange rates management is characterized by different regime changes. Exchange rate regimes have changed from being fixed to a managed floating and to free floating from the year 2000 (Benlialper and Comert, 2016). These changes reveal the importance attached to the exchange rate system. Increase in global integration by most emerging countries led to exchange rates management advantages that led to increasing trade and economic growth (Luo and Tung, 2007). The evolution of the exchange rate system in South Africa is summarized below.

- ❖ **February 1961 – July 1971** (Fixed exchange rate regime: Rand pegged to the British pound).
- ❖ **August 1971 – November 1971** (Fixed exchange rate regime: Rand pegged to the US dollar).
- ❖ **December 1971 – September 1972** (Fixed exchange rate regime: Rand pegged to the British pound).
- ❖ **October 1972 – May 1974** (Fixed exchange rate regime: Rand pegged to the US dollar).
- ❖ **June 1974 – May 1975** (Crawling peg Rand: Rand pegged to a basket of currencies.
- ❖ **June 1975 – May 1979** (Fixed exchange rate regime: Rand pegged to the US dollar).
- ❖ **June 1979 – January 1983** (Dual exchange rate regime: Crawling peg commercial Rand and free floating financial Rand).
- ❖ **Feb 1983 – August 1985** (Unitary exchange rate: Managed float Rand).

- **September 1985–February 1995** (Dual exchange rate regime: managed float commercial and free float financial Rand).

- **March 1995 – Jan 2000** (Unitary exchange rate: Managed Float Rand).

- **February 2000 to the present** (Unitary exchange rate: free floating Rand, with inflation targeting framework of monetary policy)

Information Source: Adapted from Mtonga (2011)

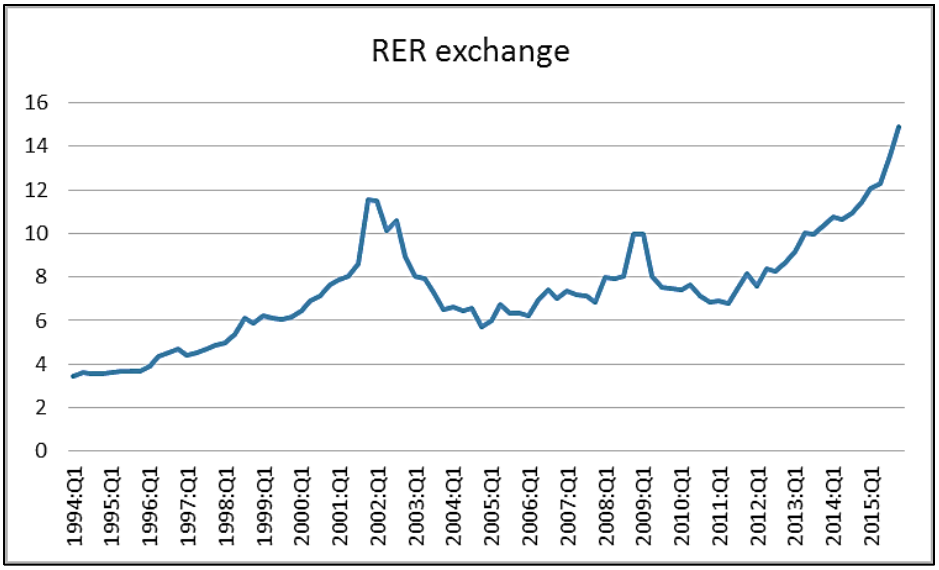
These regimes were adopted from 1960 until 2000. In the late 1960s and early 1970s, the fixed exchange rate regime was dominating and was adjusted to either against British pound sterling or US dollar at different times. In 1974, the exchange rate regime was changed to a crawling peg and the Rand was pegged to a basket of currencies and quickly returned to fixed peg against the US dollar in 1975 (Mtonga, 2011). Exchange rate stability was a major objective of the South African government as it was with other countries around the world (Natrass, et al, 2002). However, Jones and Muller (1992) argue that the South African government supported an overvalued currency to improve importation of cheap capital goods. The Rand was overvalued in order to support industrialization programs which were launched in the 70s. In 1979, socio-political events intensified in South Africa and affected the choice of an exchange rate regime to be adopted. As a result, a dual exchange rate regime was adopted to reduce the impact of socio-political events on economic development (Aron, Muelldauer, and Sinclair, 2000).

These events forced the Monetary Policies Committee to opt for more direct control measures to manage exchange rates. Van der Merwe (1996) explains that the result of financial sanctions imposed on the country forced the central bank to be involved in the foreign exchange market. SARB entered the foreign market as an active participant to control the effect of capital flows on monetary reserves. Van der Merwe (1996) also states that during the first two years of the new Government of National Unity (1994-1995), South Africa's international financial relations normalized. Steps were taken to develop a forward market with less involvement of the SARB and progressive relaxation of exchange control. Mtonga (2011) also explains that in March 1995, the exchange rate regime once more reverted to a single managed float system temporarily after the financial rand was introverted. Successful political reunion in 1994 led to the end of economic isolation as the political regime made the changeover from apartheid to all-inclusive democracy. Adopting a single managed float system was part of a broader process of progressively liberalizing the financial markets and to reinstate the country into the global economy (Mtonga 2011).

The government of South Africa stepped in to stabilize the currency (Rand) particularly during 1996 and 1998. The central bank prevented rapid depreciations of the Rand by growing its open position on its forward book in the forward foreign exchange market (Mboweni, 2004). Unfortunately, the practice negatively affected both the foreign investments and the markets' assessment of domestic economic conditions (Ayogu and Dezhbakhsh, 2008). South Africa adopted inflation targeting policy in February 2002 to curb inflationary price increase which was caused by the Asian crisis (Mtonga, 2011). For that reason, SARB stopped its foreign exchange market interventions policy to stabilize the value of the Rand through market forces. The SARB stopped to intervene in the market and this helped the negative net open situation in May 2003. This marked the end of the Reserve Bank's forward booking in the foreign exchange market in February 2004 (International Monetary Fund, 200 & Mboweni, 2004). Inflation targeting using interest as the nominal anchor from 2002 has been working successfully (Mboweni, 2004). With the adoption of the inflation-targeting framework, the exchange rate regime has become steady with a free float. However, despite the removal of exchange rates controls, trade liberalization in the foreign market remained a challenge.

On the other hand, given the ongoing debate about the proper financial planning in the context of globalization and increased macroeconomic instability, it is not clear that complete liberalization for an emerging market such as South Africa is ideal. On a different note, the mining sector contributed to exchange rate movements from the year 2000. Acar (2000) observes that in 2002 the value of gold declined and the gold exporting industry lost its footing and this led to a decrease in GDP as the rand depreciated. Also, the price of US dollar continued to increase and reached its highest rate of R13.84 per US dollar in 2002. The increase in the price of foreign currency such as the US dollar discouraged importation of major raw materials, therefore, production decreased (Acar, 2000). The South African currency began to fluctuate rapidly as shown by the (South African Rand) ZAR and United States Dollar (USD) curve in figure 2.4.

Figure 2.4. Exchange rate ZAR and USD from 1994-2015[2]



SOURCE: Data compiled from SARB 2015

Despite a partially steady exchange rate level which stretched from the mid-80s until early the 90s, an increase in the exchange rate was noticed soon after the end of apartheid in 1994. Baxter (2002) observes that periods of high exchange rate movements were associated with a noticeable sharp decrease in exports. The exchange rate increased from R6.95 per USD in 2004 to a highest ever recorded rate of R14.84 per USD in 2015 (Trading Economics, 2016). Baxter (2002) argues that the global economic crisis which originated in the United States of America stretched to the African continent. A noticeable decrease in the price of most African currencies and exchange rate led to a gradual decrease in exports in 2003.

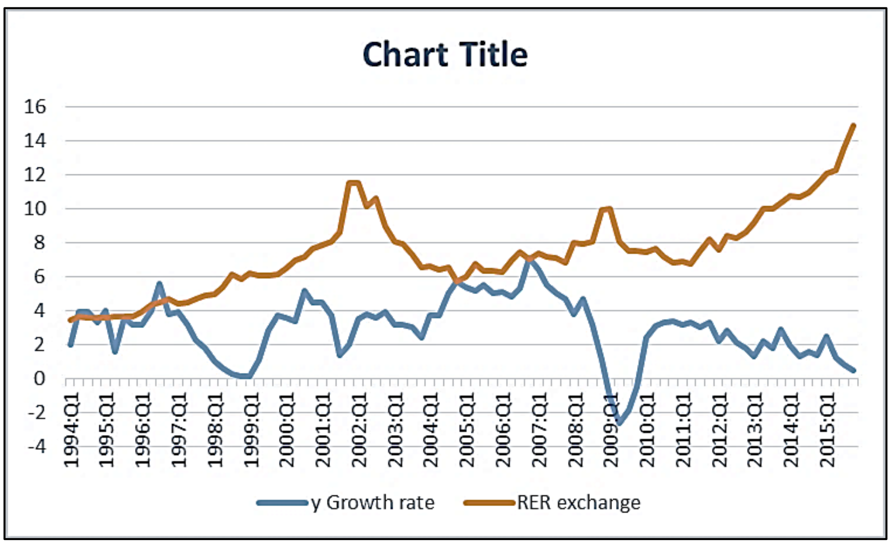
Nevertheless, periods of stable exchange rate were associated with an increase in GDP growth as shown in figure 2.4. From 1998, the South African rand became more stable and economic growth started to increase. In 1999, the financial sector improved and the economy became investments friendly (Aron, et al, 2012). A survey conducted by the International Monetary Fund on the banking system in South Africa revealed that the banking system was resilient to exchange rates variations and interest rates shocks (IMF, 2005). The government made impressive gains in stabilizing the economy through the laying of a firm financial foundation to encourage economic growth (IMF, 2005). In 2002, the main policy shifted from economic growth to inflation targeting as a way of controlling prices since the South African currency became one of the most volatile currency in the world (Bronkhorst, 2012).

[2] A scale of 2 years' period of the given trend.

2.5. GDP growth and exchange rate: 1994 – 2015

Exchange rates management is important in influencing economic growth as it determines the demand and value of exports and imports of a country (Gibley, 2016). Most developing countries rely on trade since most goods and services used in the production are purchased outside the boundaries. Production in most sectors tends to be at the forefront in determining economic development in emerging countries (Sibanda, 2012). Therefore, exchange rates stand out to be an important determinant of economic growth on cross-border trade and it functions as a measure of international competitiveness (Walters and De Beer, 1999). Figure 2.4 shows the trends of the real effective exchange rate and economic growth over the period 1994-2014. The South African economy was overhauled since the beginning of economic democracy as the country attained its political freedom in 1994 (South African Information, 2013). A sense of normality was achieved because the exchange rate remained in a long-term downward trend that began in the early 1980s. GDP growth rate reached an all-time high of 7.60 percent in the last quarter of 1994. Bold macroeconomic developments boosted the economic competitiveness in the global market and jobs were created in the economy (Treasury, 2007).

Figure 2.5. Trends analysis between GDP and Exchange rate between1994: Q1-2015: Q4



Source: - *Data compiled from SARB and DTI (2015)*

As an export-led economy, South Africa adopted an outward-looking trade policy which ensured export growth to have long-term economic growth (Sekantsi, 2015). The South African government promoted multilateral trade agreements such as African Growth and Opportunity Act and General Export Incentive Scheme (DTI, 2012). Such policies improved South African products in the international markets such as the U.S. markets. The ratio of exports to GDP increased extensively from 24.5 % in 1996 to about 32.71 percent in 2002 and GDP increased by 2.6 %. Nonetheless, the real exchange rate was under pressure from external forces. Between April and August 1998, the currency came under massive pressure, depreciating by some 20 per cent in real terms before recovering part of its value in September and October (Gibley, 2016). Despite the short-term improvement, the exchange rate volatility remained a serious risk in the distressed international financial environment.

Hanival and Maia (2014) mentioned that by the end of 1998 the Rand was heavily affected by the East Asian crisis in 1998. GDP, on the other hand, deteriorated as the objectives of GEAR were also adversely impacted by the Asian crisis. From 1998 to 2002, the Rand was persistently weaker (IDC, 2016). The Rand depreciated considerably at about 28% in nominal terms against the US dollar from 1998 (Hanival and Maia, 2014). In 2002 and 2003, the exchange rate appreciated in value and economic growth improved respectively as shown in figure 2.5. From 2005 to 2007, both the exchange rate and economic growth were stable as shown above. Nevertheless, a further period of global instability set in early 2008, which caused the Rand depreciating by 21% against the US dollar between 2008 and 2009. The year 2010 experienced a further appreciation of real effective exchange rate to 113.89 from 101.41 in 2009. This was accompanied by a slight increase in economic growth by R36594 (Hanival and Maia, 2014). However, from 2011 to 2014, both economic growth and real exchange rate increased simultaneously (StatsSA, 2014).

2.6. Chapter Summary

This chapter provided an overview of economic growth and real exchange rates trend analysis in South Africa from 1994 to 2015 with greater emphasis on the period from 1994. The chapter also discussed the exchange rate systems and exchange rate regimes adopted in South Africa from 1971 until 2014. Different phases are symbolized by different movements between economic growth and exchange rates in the South African economy. In 2008, a sharp increase in real exchange rate led to economic growth to slightly decrease. The decrease in economic growth in 2009 emanated from varying currency and fluctuations in the economy. Different periods are dominated by either increase in or decrease in both exchange rate and economic growth. There is no clear link between exchange rates and economic growth and this recommends for further analysis between the two macroeconomic variables. Having outlined the trends in various macroeconomic variables, the next chapter reviews literature relevant for this study.

CHAPTER 3

LITERATURE REVIEW

3. Introduction

This chapter presents the theoretical and empirical literature which forms the analytical framework basis of this study. The chapter begins by analyzing theories of exchange rates transmission channels to economic growth and other growth models. Finally, the last section analyzes empirical studies done by various authors and different methods of research applied in this field to identify existing gaps on this topic.

3.1. Review of the Literature: The theoretical evidence

Economists around the globe have long agreed that economic growth is important for the welfare of individuals and the country at large (Department of International Development, 2013). Fritz, et al., (2010) concur that economic growth experts recommend that developing countries should implement effective policies as a way of promoting economic growth and macroeconomic stability. To understand more on exchange rate linkage to economic growth, the study employs different exchange rate transmission channels under the monetary mechanism.

3.1.1. Monetary transmission mechanism

As explained by Ireland (2005), monetary policy transmission mechanism describes ways in which pricing-induced changes in monetary policy stance impact real variables such as aggregate output (GDP) in any economy. Considering exchange rate transmission channels, the channels are one of the intermediate policy variable used to induce growth through international trade in most developing economies (Barro and Sala-I-Martin, 2004). These channels are used by most central banks to improve GDP through the influence of exchange rates on the value of domestic inflation (pass-through effect), macroeconomic credibility, capital flows and financial stability in an economy. Mtenga (2015) observes that in many open economies, monetary policy stance induces a short-run intermediate change in the exchange rate that translates changes in aggregate output via trade. Thus far, changes in the exchange rate (devaluation or revaluation) can induce changes in the overall GDP as the relative price of goods and services available for domestic and foreign spending by individuals and firms is determined by how competitive the exchange rate is in an economy (Usman and Adejare, 2014).

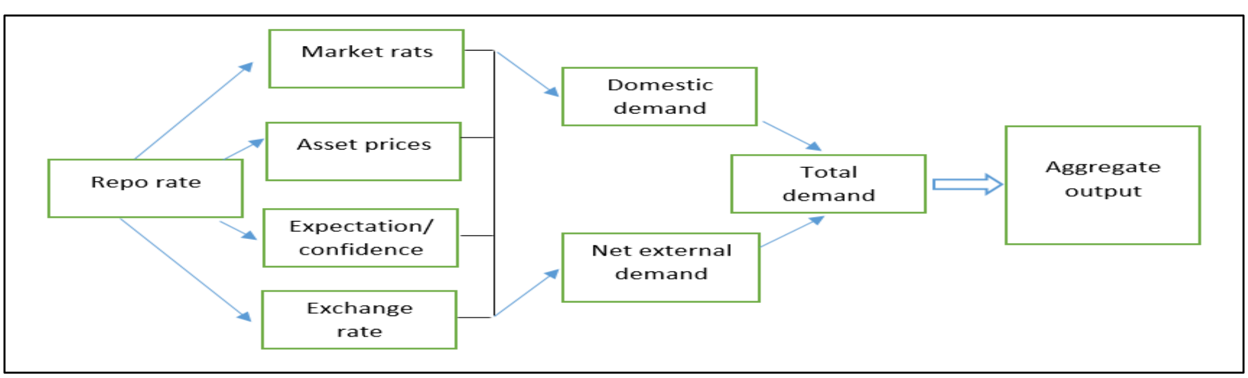
Currency depreciation or appreciation induces expansionary or contractionary effects on domestic production in the short-run depending on consumers and producers expectations within the economy (Usman and Adejare, 2014; and Pettinger, 2014). Exchange rate devaluation or revaluation policies are then regarded as major mainstreams used to improve GDP considering an international trade, capital flows and foreign investments (Khondker, et al., 2012). The exchange rate devaluation transmission channel is discussed in detail below.

3.1.1.1. Exchange rate devaluation transmission channel

From the work of Mtenga (2015), the most popular argument in explaining exchange rate devaluations' effect on growth is through an increase in exported goods and services mostly under fixed exchange rate system.The logic behind exchange rate devaluation transmission channel is that: it makes domestic manufactured goods and service relatively cheap compared to foreign manufactured goods (Galebotswe and Andrias, 2009). The increase in demand for domestic goods increases production and it boosts exporting industries which in turn increases real GDP in the short-run. The basic traditional view as explained by Yiheyis (2006) states that exchange rate depreciation increases real exports volumes and reduces the import volumes, consequently providing expansionary effects on aggregate output in the economy.

Thus, the expenditure-switching from foreign goods and services in the domestic market induces expansionary effects on aggregate demand a which ultimately increases real GDP economy. Galebotswe and Andrias (2009) argue that exchange rate devaluation effect has led central banks, mostly in a flexible exchange rate system, to actively use exchange rate devaluation as a monetary policy instrument to promote exports and economic growth. Since exchange rate movements have a direct effect on the domestic prices of imported good services, the role of the excahnge rate in the transmission mechanism is best described in figure 3.1.

Figure 3.1. The transmission mechanism of monetary policy



Source: adapted from George (2016)

Goerge (2016) mentioned that the Monetary Policy Committee (MPC) influences activities within the economy via setting the short-term and long-term official rate (Repo rate). Many MPC uses repo rate transmission channels to achieve the goals of macroeconomic management (Ohuche, 2014). Thus, the use of Repo rate to influence the level of the exchange rate has proved to be an effective way of monetary policy transmission channel. Goerge (2016) mentioned that policy-induced changes in the Repo rate affect the exchange rate and the precise impact is conveyed to expectations, asset prices and market prices which then affects domestic demand and Net external demand as depicted in figure 3.1. The precise impact on domestic demand and net external demand affects total demand hence aggregate output increases (Ohuche, 2016). Goerge (2106) concluded by saying that, holding other things being equal, Repo rate depreciation will probably lead to an immediate depreciation of the domestic currency and vice-versa for a similar Repo rate appreciation. In the case of an appreciation, the exchange rate appreciates follows from the fact that higher domestic Repo rate, relative to interest rates on equivalent foreign-assets, makes the domestic currency more attractive to international investors (Goerge, 2016).

Thus, the exchange rate is one of the immediate policy variables through which monetary policy is transmitted to the larger economy through its impact on the value of the domestic currency, domestic inflation (the pass-through effect), the external sector, macroeconomic credibility, capital flows and financial stability (Ohuche, 2016). Thus, changes in the exchange rate induce a change in the relative price of goods and services, and the level of spending by individuals and firms, especially if significant levels of their wealth are held in foreign currencies. This effect is well explained by exchange rate mechanism which has two strands, the demand side and supply side effects on growth as explained by Galebotswe and Andrias (2009).

3.1.1.2. Monetary Policy stance (Exchange rate devaluation and revaluation): Demand side effect

Galebotswe and Andrias (2009) posit that exchange rate devaluation mechanism has expansionary effects on GDP through demand-side and supply-side effects. Monetary Policy Authorities can induce an intermediate change in the money supply to improve economic growth mostly if local goods and services are price elastic and there is perfect capital mobility (Mtenga, 2015). For instance, expansionary monetary policy pushes the domestic interest rate down. In a perfect capital mobility economy, capital flights result in an immediate and sharp depreciation of the nominal exchange rate. In this situation, Galebotswe and Andrias (2009) reveal that decrease in interest rate depreciates the real exchange rate and exports become relatively cheap in the short-run ceteris paribus. Demand for domestic merchandise increases in the exporting industry hence improves production consequently GDP. Pettinger (2013) argues that currency depreciation increases demand for locally produced goods (exports), in turn, it increases domestic production and GDP respectively. Thus far, increase in demand for exports increase production resulting in economic growth. Hence, the logic behind expansionary effects of a depreciated currency on GDP is seen through the increase in demand for exports reflected through an increase in AD in figure 3.2.

Figure 3.2. Exchange rate depreciation and appreciation (Aggregate demand)

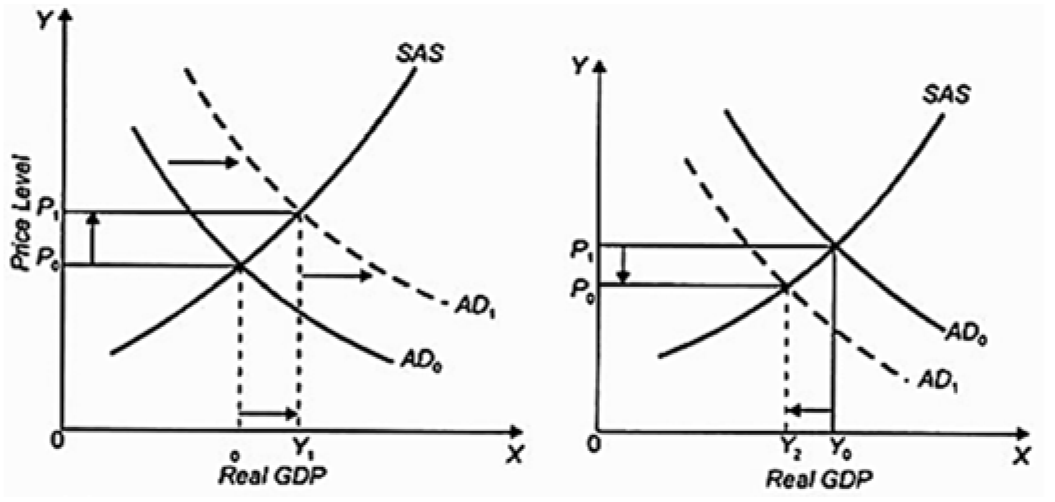


Fig 3.2a (Increase in GDP & price level) Fig 3.2b (Decrease in GDP & price level)

Adapted from Mukher, (2014)

Mukher (2014) states that in the Keynesian model of determination of real national output (GDP), exchange rate depreciation has a favorable effect on GDP. As shown in figure 3.2 currency depreciation causes net exports to rise hence AD_0 shifts outwards and GDP increases fromY_0 - Y_1. As such developing countries can intervene in the foreign exchange market by depreciating their exchange rates as they have expansionary effects on real GDP as shown in figure 3.2. In support of exchange depreciation and its effects on real GDP, Sibanda (2012) claims that currency appreciation has far reaching disadvantages on the well-being of an economy. Exports become relatively expensive as compared to foreign-produced goods and services. AD decreases as shown in figure 3.2 from AD_0 to AD_1 in fig. 3.2a. Thus, aggregate demand for exports decreases hence low production and lower growth and real GDP decreases from Y_0–Y_2. Exporting industries which are one strong arm for economic growth are heavily affected by strong currency. Consequently, imports are preferred to locally manufactured goods (Ali, 2011). This implies that net exports decrease causing current account deficit and lower economic growth. In addition, Pettinger (2014) postulates that currency appreciation impacts the current account negatively if demand is relatively elastic. If exports are relatively expensive as compared to imports, demand for imports increase and this causes a bigger deficit on the current account (Mukher, 2014). Nonetheless, this current account deficit it subjective. Ireland (2005) argues that currency appreciation turns to reduce inflation and make domestic goods and services competitive, leading to stronger exports in the long-run. Hence, the strong currency has a contractionary effect on growth in the short-run and expansionary effects in the long-run.

3.1.1.3. Monetary Policy stance (Exchange rate devaluation and evaluation): Supply side effect.

Supply side policies are government policies put in place to increase productivity and efficiency in the production system within the economy (Pettinger, 2013). The main macroeconomic objectives of the government include high economic growth, low inflation, and equilibrium on the balance of payments (SARB, 2016). One channel in which supply side economics influences economic growth is via international trade. Exchange rate as a medium of exchange is one tool used to alter trade for the betterment of the economy. Most central banks depreciated their currencies in order to improve or boost production for exporting firms and balance of payments (Pettinger, 2014). As articulated before, currency devaluation makes firms more productive and competitive as they are able to export more at lower prices. The increase in exports means more production and has an expansionary effect on economic growth. A more detailed explanation on the true link between exchange rates and an increase in trade is explained under the Marshallian Learner Condition in the following section.

3.1.2. Marshallian Learner Condition (MLC)

Welker (2016) explains the Marshallian Learner Condition (MLC) as follows:

> *MLC is a concept which relates exchange rate depreciation to an increase in aggregate production. MLC is now a dominant condition amongst models which explain the link between exchange rate and production via international trade in order to improve economic growth. The MLC success is founded on its portrait of growth episodes as a succession of developing states where growth is governed by international trade. MLC suggests that exchange rate devaluation improves the balance on the current account assuming that the combined elasticity's of demand for imports and exports is greater than one.*

In-depth analysis of MLC is provided through the J-curve in international trade. The above scenario is explained in two scenarios under the J-Curve effect below:

Scenario 1

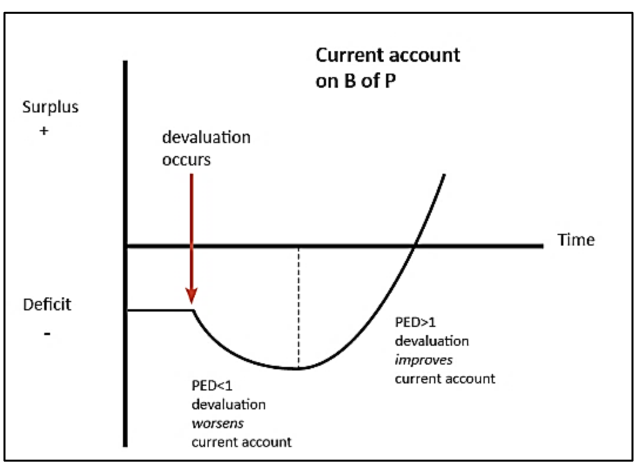
If (Price Elasticity of Demand for exports (PEDx) plus Price Elasticity of Demand for imports (PEDm > 1) then a devaluation will improve the current account. Exchange rate depreciation makes imports more expensive and exports cheaper (in terms of the purchasing currency). Melker (2016) states that increase in demand for exports boosts the local exporting industry. Production increases hence both employment and real output increases. Therefore, if PEDx is > 1, currency depreciation increases demand locally manufactured goods by the international community hence, economic growth increases.

Mtonga (2015) points out that, in the case of currency depreciation, there may be periods where depreciation initially causes a sharp worsening of the balance of trade (merchandise exports fewer merchandise imports) which results in trade imbalances. This causes a J-curve to be a downward sloping curve as shown in fig 3 below. Similarly, a currency appreciation would cause an inverted J-curve. A detailed currency appreciation is explained in Scenario 2 below.

Scenario 2

If Price Elasticity of Demand exports (PEDx) plus Price Elasticity of Demand imports (PEDm < 1) then a devaluation will worsen the current account. As such, currency depreciation negatively affects the trade balance both in the short-run and long-run. Mtonga (2015) explains that in the long term, depreciation is likely to increase inflation because imports become expensive. Therefore, if PEDx < 1 currency appreciation improves, the current account deficit as indicated in fig 3 when the J-curve has a positive slope.

Figure 3.2 The J-curve effect



Adapted from Welker (2016)

In the short-run, supply for exports and imports tends to be inelastic. Welker (2016) posits that currency devaluation in the short-run temporarily worsens the current account. This is shown in figure 3.2 when PED < 1 devaluation worsens current account resulting in current account deficit. If PED > 1 exchange rate devaluation is good for current account and it boosts exports this results in a favorable current account. In this instance, taking the supply side into effect, the most effective way to improve economic growth in the short-run is through exchange rate appreciation. Exchange rate appreciation boosts production for imported capital industries as raw materials are cheap hence producing more at a lower cost. Lower costs lead to high production and lower prices, high demand and high production hence economic growth (Mtenga, 2015). However, currency devaluation over time, (long-run) improves the current account as shown in figure 3.2. Demand becomes more price elastic and the lower the price the higher the demand hence the current account improves (Pettinger, 2013). One of the challenges of currency devaluation in both the short-run and long-run is that it leads to imported inflation (Welker, 2016). Basically, an increase in demand for imports will result in pulling the price of imports up hence increases the cost of production for importing industries.

However, Acar (2000) posits that exchange rate depreciation has a negative effect on aggregate demand and eventually economic growth in the long-run as inflation sets in. Exchange rate devaluation or depreciation tends to raise the price level and thus increases the rate of inflation (Mukher, 2014). If prices for exports and imports are inelastic, devaluation might negatively affect international terms of trade (Galebotswe and Andrias, 2009). Exchange rate revaluation is a favorable monetary policy instrument if prices are inelastic. As such the country pays more in real exports for each unit imported. At the same time, inflation is likely to increase following a devalued currency because imports are more expensive causing cost-push inflation from capital importing industries (Pettinger, 2014). Pass through effects from exchange rate devaluation to increase in inflation is likely to be the case in most developing economies (Acar, 2000). With exports becoming relatively cheap, manufacturers may have fewer incentives to cut costs and become more efficient, nonetheless, in the long-run, costs are likely to increase due to inflationary prices of raw materials. Sahadudheen (2012) describes how the Structural Approach explains the disadvantages of exchange rate depreciation and appreciation. These are discussed below:

3.1.2.1. Effects of Depreciating currency on capital investments

A depreciated currency has negative effects on investments whose production uses imported capital. The price of imported capital increases because of weak currency since the purchasing value of imports increases. Firms that depend on imported capital experience high production costs and high production costs discourages investments (Sahadudheen, 2012). Most developing economies depend on imported capital thus, imports become very expensive under a depreciated currency (Acar, 2000). In addition to increased cost of production, currency depreciation affects real wealth negatively and increases foreign debts payments as discussed below. Currency depreciation also affects the value of assets which are foreign owned in the economy. Foreign investments are discouraged since the value of assets within the economy is negatively affected by the loss of value on the trading currency (Sahadudheen, 2012). Pettinger (2014) argues that loss in value for foreign-owned assets in the domestic economy compared to the value they have in other economies with stronger currencies leads to capital outflow. Investors lose confidence in economies with weak currency hence they transfer their assets to countries with stronger currencies. Capital flights have a contractionary effect on GDP as production decreases in the domestic economy.

3.1.2.2. Effects of depreciating currency on foreign payments

Odera (2015) points out that the balance of payments crises, expansionary fiscal and monetary policies led to heavy external borrowing in most developing economies especially soon after their independence. As such, most developing economies' external debts increased due to exchange rate depreciation. Thus, currency depreciation increased the debt since they are paid mostly in the currency of the debtor country. Both local businesses and the government pay more after currency depreciation (Odera, 2015). Large amounts of accumulated external debt make depreciation unfavorable in most developing countries. Gibley (2016) observes that currency depreciation makes it difficult to pay for foreign debts in most developing economies. It makes debts very expensive to pay especially when dealing with strong currencies. Thus, even though currency depreciation boosts exports, this comes with the serious disadvantages. Therefore, currency appreciation is favorable for foreign debt clearing.

In conclusion, theory suggests that exchange rate devaluation can improve economic growth in cases where price elasticity of demand is greater than 1. Exchange rate devaluation has been found to have a positive effect on growth in the short-run. In the long-run devaluation negatively affects production as inflation sets in. Nonetheless, exchange rate appreciation is favorable when demand is inelastic both in the short and long-run. There are other channels in which the exchange rate influences economic activities within an economy. Different theories such as Solow-Swan growth theory and Keynesian theory explain how exchange rate influences economic growth in the economy. These theories are discussed in the following subsections.

3.1.3. Solow-Swan Growth Model: Endogenous Growth Theory

Solow and Trevor in 1956 developed the Solow growth model, also known as the neoclassical growth model. The Solow growth model is an extension of the Harrod-Domar Model. This model states that three drivers of economic growth are capital accumulation, technology and labor force (Cheung, 2013). The increase in capital, labor force and technology increases economic growth. Furthermore, Cheung (2013) argues that in an economy with one worker, an addition of another worker ceteris paribus, then the output will increase dramatically. Increasing only labor force ceteris paribus decreases economic growth due to diminishing returns to scale.
Solow growth model basic assumptions are as follows:

- One composite commodity is produced,
- Output is regarded net output after making allowance for depreciation,
- There are constant returns to scale,
- There are diminishing returns to scale to an individual input,
- The two factors of production, capital, and labor, are paid per their marginal physical productivity.[3]

The revised version of Solow (1956) and Swan (1956) reviewed the assumptions that labor cannot be replaced by capital in the Harrod-Domar model in economic growth as capital is fixed (Xiaoqing, 2005). In this regard, the key aspect of the Solow-Swan model is the neoclassical form of the production function, a specification that assumes constant returns to scale, diminishing returns to each input, and some positive and smooth elasticity of substitution between the inputs.

Mankiw (2005) postulates that in order to understand more about growth; a further analysis beyond Solow model should be implemented to cater for technical advancement through international trade. Quite a number Endogenous Growth Models were formulated in order to analyze the effects of international trade and technological advancements on economic growth. Mankiw (2005) analyzed endogenous growth by employing a Two-sector Model as follows:

$Y = F[(K,(1-u)LE]$ *(production function in exporting manufacturing firms)* ……….……..3.1

$\Delta E = g(u)E$ *(production function in research universities)*……………………..…………….....3.2

$\Delta K = sY - \alpha K$ *(capital accumulation)*…………………………………………..……..…………3.3

[3] See Chard, S (2014) The Solow-Swan Model for more assumptions.

Where:

u denotes the fraction of the labor force in universities,
(1-u) denotes the fraction of the labor force in the manufacturing,
LE denotes the stock of knowledge,
g denotes a function of the growth in knowledge,
K denotes Capital,
Y denotes total output (GDP)
s denotes steady stock of physical output,

The above model exhibits a constant return to scales in the economy. If capital is doubled in both manufacturing firms and in research universities, the output would double, hence GDP doubles with the same scale. Factoring in exchange rates, Mankiw (2005) suggests that exchange rates affect output in the economy. Exchange rate appreciation decreases exports hence, the output for both manufacturing firms and research universities decreases. The decrease in total output has contractionary effects on economic growth. Therefore, Mankiw (2005) posits that currency depreciation increases exports and improves economic growth.

In the case of foreign direct investments, an increase in input prices in the manufacturing firms due to currency appreciation discourages potential foreign investments. Currency appreciation results in increased cost of production and firms respond by increasing prices or cutting production. If prices increase, inflation sets in which further discourages foreign investments and cutting production have again the contractionary effect on economic growth (Gibley, 2016). Therefore, the endogenous growth model explains clearly how other macroeconomic variables can affect output growth in manufacturing industries. Sibanda (2012) concludes that one of the major determinants of net exports is exchange rates. Thus, the exact impact of exchange rates depends on a number of features such as the pricing strategy of firms engaged in international trade and the importance of the global production network. Therefore, there are several channels in which exchange rates affect economic growth and in most cases via the trade balance. The Keynesian model is another growth theory which explains how exchange rates can affect economic growth mostly in developing the economy. A detailed approach to Keynesian model is discussed in section 3.1.4.

3.1.4. Growth theory in a Keynesian model: Some Keynesian Foundations for new endogenous growth theory

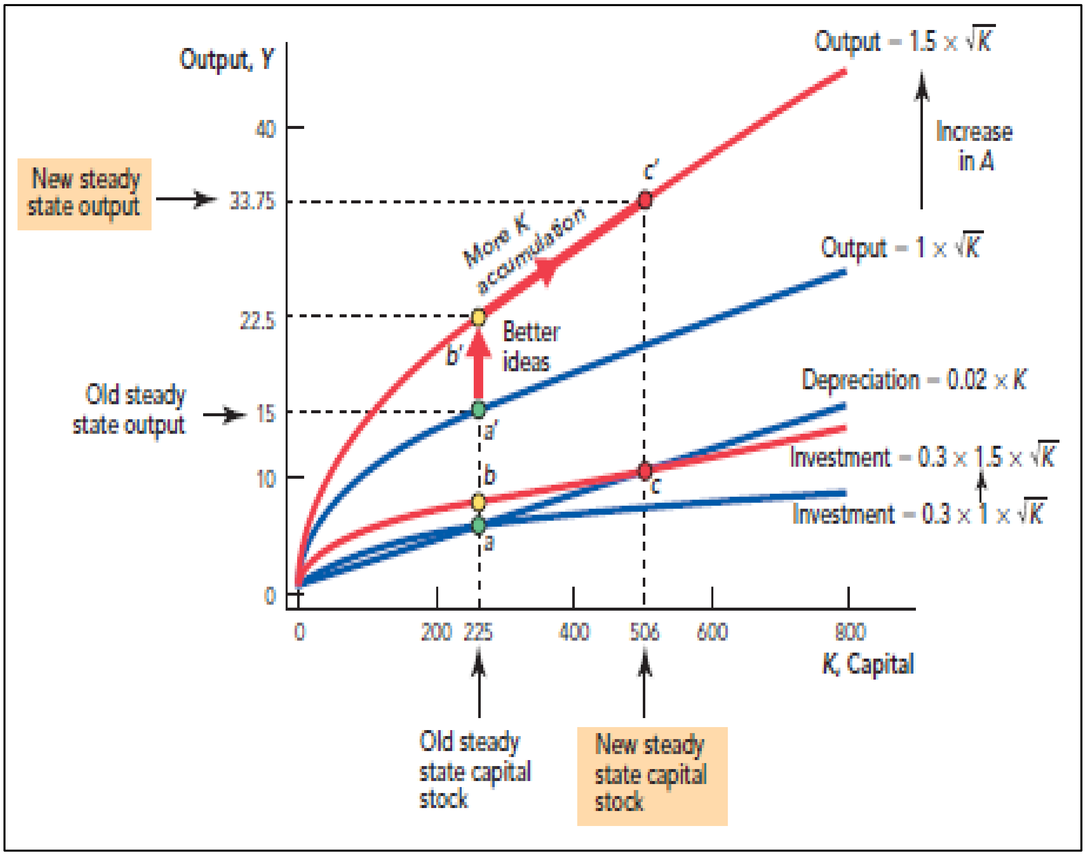
Palley (2012) explains how endogenous growth theory can be modified to incorporate Keynesian aggregate demand theoretic foundations. There are two critical Keynesian principles of the growth process and these principles are expressed by Palley (2012) as follows:

1. Capital accumulation is driven by investment.
2. In equilibrium, the rate of output growth must equal the rate of aggregate demand growth, which implies that the rate of aggregate demand growth can potentially compel the rate of output growth.

Capital accumulation involves acquiring more financial assets that can be used to create more wealth or that will appreciate in value (Palley,2012). Capital accumulation forms the basis of capitalism which is found to be a critical Keynesian influence on growth. Capital accumulation is often equated with an investment of profit income or savings, especially in real capital goods (Ewubare and Ogbuagu, 2015). Thus, increase in capital accumulation increases the capital flow and investment in financial assets. In addition, Ewubare and Ogduagu (2015) posit that Keynes suggests that capital accumulation and productive capacity that the people in a society hold in common leads additional production. Thus, Palley (2012) proposes that the most important feature which increases wealthy under the Keynesian model depends exclusively on the rate of population growth and labour-augmenting technical progress. If population increases, investments and savings increases which in turn increases production capacity in an economy. If the saving behavior of households increases, capital accumulation increases and investments in profitable savings such as real capital goods leads to economic growth (Ewubare and Ogbuagu, 2015).

Antono, Commendatore, and D'Acunto (2014) also mentioned that increase in population and the level of education also leads to better ideas generated hence more output and more capital accumulation. Keynes adopted this approach from Solow growth model show how better ideas can lead to producing more output from the same inputs of capital (Antono et al, 2014). Figure 3.3 shows the process in which increased ideas can lead to more output.

Figure 3.3. Better Ideas Generate More Output and More Capital Accumulation



Source: Adapted from Cowen (2014)

Figure 3.3 shows the process of how better ideas generate more output and more capital accumulation a diagram ideas as expressed by Keynes. (A) denotes ideas, (K) denotes capital. Antonio et al, (2014) assume that a big (A) means that the economy is working with better ideas that increase output for the same level of capital. Thus, imagine that the economy begins with (A) = ideas = 1. The economy is in the steady state and output = 15 at point (a') Now suppose that (A) increases to A = 1.5. better ideas produce more output from the same capital stock, so output immediately increases from 15 at point (a') to 22.5 at point (b'). This shows that increase in ideas generates more output and with greater output, investment also increases, moving from point (a) to point (b). Since investment is now greater than depreciation, capital begins to accumulate. Capital accumulates and the economy grows until the investment is once again equal to depreciation at point (c) at which point output is now 33.75 at point (c'). Thus, better ideas increase output directly because of higher productivity and indirectly due to more capital accumulation (Antonio et al, 2014). This shows how the Solow growth theory fits in Keynes' idea of how capital accumulation generated from better ideas within the economics of ideas fit together. Thus, better ideas increase output directly and by so doing they increase capital accumulation indirectly.

Endogenous growth model concurs with Keynes view which holds that capital accumulation increase in the long run trend rate of economic growth (Pettinger, 2012). Capital accumulation can be permitted mostly when the savings ratios mostly in developing countries to increase their long-term growth rates. Pettinger (2012) mentioned that increase in saving ratios, maintaining good banking system and system of loans and good researchers institutions to generate more ideas are some of the aspects which enable an increase in capital accumulation. In conclusion, Cowen (2014) states that to better understand economic growth on the cutting edge economic agents must turn to the economics of ideas and the following philosophies should be emphasized.

- Ideas for increasing output are primarily researched, developed, and implemented
- by increasing output of intellectuals in various disciplines.
- Spillovers mean that ideas are underprovided.
- The government has a role in improving the production of ideas.
- The larger the market, the greater the incentive to research and develop innovative ideas.

As for the second Keynesian principle of the growth process, effective demand plays a crucial role in affecting the growth path of the economy and therefore, pushing the economic system close to full employment (Antonio et al, 2014). The principle of effective demand was independently discovered by Kalecki (1933) and Keynes (1936). The Keynesian theory does not assume that supply meets aggregate demand if only the prices are flexible enough in an economy. Thus, the Keynesian theory explains how aggregate demand growth affects output growth via investment spending, and investment spending affects the rate of technical progress (White, 2015). Investment is one of the determinants of aggregate demand and that aggregate demand is linked to output.

The theoretical and practical insight Keynes provides that 'the level of income must be the factor which brings the amount saved to equality with the amount invested' (Keynes, 1936). The Keynesian theory is logically interested in the policies that may change, rather than strengthen the fixed operative of a capitalist economy by producing adequate aggregate demand to recover output and employment when a crisis occurs. Keynes expressed the investment function as follows;

$i = v\, g^* + f\,(g - g^*_{t-1})$ ……………………………………………………………………..…………...3.4

With $f(0) = 0$ and $f' > 0$

Where:

i represent the ratio between investment and the net output of the economy;

g^* the current period expected the rate of growth of output;

g^*_{t-1} the previous period expected the rate of growth;

g the current period rate of growth;

v the equilibrium capital/output ratio;

Investment can change in response to its expected profitability, which in turn is shaped by expectations about future economic growth.

Commendatore et.al. (2001) used the Harrod (1939) analysis to explain how the Keynesian investment function affects output growth. Harrod (1939) used his analysis to study the "rational" rate of growth (g_w) and defined growth as that equilibrium rate which allows the normal utilization of capital equipment.[4] Harrod assumed that along with the warranted equilibrium path, expectations are realized and the expected rates of growth are equal to the warranted rate ($g^*=g^*_{t-1}=g_w$).

The following equations were thus used for the analysis of the warranted rate.

$s = v\, g_w$……………………………………………………………3.5

$v = v\,(r)$……………………………………………………………3.6

With $v' = 0$

$r = r_0$……………………………………………………………3.7

Where:

s represents the average propensity to save the economy;

r represents the rate of interest.

Commendatore et al. (2001) assume that the introduction of equation (3.5) and (3.6) point out towards an opposite extensive view that Harrod did not develop his analysis of growth by assuming the absence of monetary influences and fixed technical coefficients. Equation (3.7) undertakes that the rate of interest depends on the conduct of monetary policy. Commendatore et al. (2001) explain that according to Harrod, the economy operates by stabilizing this rate at some specified level.[5] Equation (3.5) recognizes the possibility of substitution between factors of production. Harrod admitted the existence of decreasing marginal returns but considered that this kind of substitution was low, following the results reached by the Oxford Research Group in which he actively participated.[6]

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[4] According to Asimakopulos [2013], the rational rate is that which if it occurs, leaves producers satisfied, in the sense that for them 'stock in hand and equipment available will be exactly at the level they would wish to have them.

[6] See Oxford Research Group, (1941) Keynesian approach.

Commendatore et.al. (2001) suggest that the Keynesian theory is based mainly on cumulative causation, underline the connection between demand externalities, increasing returns and productivity growth. The role of these factors in growth is relevant in the “evolutionary” approach to growth and it is now generally accepted. In fact, the “endogenous growth theory” represents the attempt of mainstream economics to introduce them in formal analyses. In this sense, the Keynesian approach to endogenous growth could be extremely enriching, assigning also to the demand side a crucial role in favoring economic growth. However, FDI plays an important role in economic growth and exchange rates levels attract or discourage FDIs depending on the market mechanism. The International flow of capital that provides parent companies or multinational organizations with control over foreign affiliations positively affects economic growth (Goldberg, 2006). Exchange rates play an important role in determining the level of foreign direct investments. Therefore, the exchange rate can affect growth via FDIs and imported technology.

In conclusion, exchange rates influence different macroeconomic variables that affect economic growth. Foreign investments, capital accumulation, income, international trade and other macroeconomic variables are correlated to exchange rates' movements. After adopting free floating exchange rate systems, economic growth has been fluctuating rapidly. Some periods are characterized by an increase in growth, but other periods are associated with a decrease in economic growth. Different growth theories were analyzed, and these indicate that various macroeconomic variables play a significant role in economic growth.

3.2. Exchange rate levels and its impact on Economic growth: Empirical Evidence

This section reviews the different literature and traces the proposed relationship between exchange rates and economic growth. Firstly, a study by Padachi, Polodoo, and Seetanah (2010) used panel data from 1999 to 2010 to examine the relationship between macroeconomic policies' implementation in small developing economies in Small Island Developing States. Employed in the study is Z-score, which measures the exchange rate instability. The results proved that exchange rate depreciation or appreciation affects economic growth positively after a basic panel ordinary least square regression analysis was conducted. The results revealed that a significant change in exchange rate levels results in an increase in the level of economic growth.

Padachi et.al’s observations are similar to those of Schnabl (2008) who researched the impact of exchange rate on economic growth in small open economies in European Monetary Unity (EMU).

A panel data of 41 countries in the EMU boundary from 1994 to 2005 was estimated. Exchange rate instability was captured as a yearly average of the monthly percentage exchange rate. Both Generalized Least Squares (GLS) and Generalized Method of Moments (GMM) were performed and the results provided adequate evidence that there is a negative relationship between exchange rate volatility and economic growth. Schnabl's (2008) results indicated that exchange rate instability leads to a decrease in economic growth. Therefore, macroeconomic policies which stabilize the economy are needed to keep the economy operational.

Frenkel and Rapetti (2012) assessed the role of the real exchange rate as a target of macroeconomic policy. The study observed that several authors have debated that developing countries should aim to target a Stable and Competitive Real Exchange Rate (SCRER) to improve economic growth. The study points out that the macroeconomic regime focused on the preservation of an SCRER has been the principal factor in explaining the rapid growth. In addition, the study also indicated that even though more theoretical work is needed, there are several policies from development theory that can assist in explaining the empirical discoveries. These policies encourage economic growth not only by preserving external and fiscal accounts sustainability but also by providing incentives to the tradable sector and thus exerting expansionary effects on production, employment, and investment. Frenkel and Rapetti (2012) study supports the view that developing countries could target SCRER as part of a growth strategy that encourages the development of modern tradable activities.

Rodrik (2008) analyzed the relationship between real exchange rate and economic growth. The study revealed that undervaluation of the currency (a high real exchange rate) stimulates economic growth in many developing countries. Rodrick's study used different measures of the real exchange rate and different estimation techniques. The study provided some evidence that the operative channel determines the size of the tradable sector specifically in exporting industry. The results of the study suggested that tradable sector suffers disproportionately from the government or market failures that keep less developed countries from converging toward countries with higher incomes. Rodrik presented categories of explanations for there is such disproportionate in two ways. The first way focused on institutional weaknesses and the second way on product-market failures. Consequently, the study used a formal model which explained the linkages between the real exchange rate and the rate of economic growth. The study concluded by expressing that undervaluation of the currency influences economic growth positively.

Furthermore, Bottechia, Gomes, Holland, and Vieira, (2013) pointed out that there is a link between exchange rate movements and economic growth as a set of 82 emerging and advanced economies were considered. Data panels ranging from 1970 to 2009, a total of 39 observations were used. In analyzing data, ARIMA was employed to develop the monthly volatility measure for real exchange rate. Estimating the vibrant panel data growth model, it was discovered that real exchange rate has a significant negative impact on economic growth, thus, an increase in real exchange rate movements can lead to a decrease in economic growth. Holland, et al. (2013) are more robust for different model specification.

Masunda (2011) investigated the impact of real exchange rate misalignment on sectoral output in Zimbabwe. To achieve this, Masunda used the practical generalized least squares' panel data techniques using data for the period between 1980 and 2003 from a sample of Zimbabwean sectors which include agriculture, manufacturing, and mining. The study indicated that real exchange rate misalignment is risky to sectoral output. The findings from the study were that undervaluation negatively affects the sectorial output while exchange rate overvaluation positively and significantly affects sectoral output.

Azee, et al (2012) surveyed the impact of exchange rate fluctuations on macroeconomic functioning from 1986 to 2010, a period of 24 years in Nigeria. OLS and Johansson Co-integration estimation technique were used to test for the short and long-run effects. The Augmented Dicky-Fuller (ADF) test results indicate that all the variables used for the study were stationary. The results revealed that real exchange rate movement impacts positively on GDP in the long-run. An increase in exchange rate levels results in an increase in the level of economic growth.

Clark (1973) analyzed the impact of exchange rate movements on trade in LDCs. The study used a log-level model specification to observe how Brazilian exports were reacting to changes in exchange rates. Clark covered a total of nine observations (1965-1974), and the results revealed that a big decrease in the level of exchange rate led to confusion in the Brazilian economy throughout the crawling peg era. There was no clear reflection on how exchange rate volatility affects trade in Brazil.

Habib, Mileva, and Stracca (2016) investigated the impact of movements in the real exchange rate on economic growth based on five-year average panel data of over 150 countries in the post-Bretton Woods period. The study used external implements to deal with possible reverse causality from growth to the real exchange rate. The study used specific instruments which are global capital flows interacted with individual countries financial openness and the growth rate of official reserves. Habib, et al., (2016) study revealed that a real exchange rate appreciation negatively affects annual real GDP growth.

Breitenbach, Tipoy and Zerihun (2016) analyzed the deviation of exchange rates from a long-run equilibrium for a sample of 10 emerging countries using the behavioral equilibrium exchange rate (BEER) approach from 1980 to 2013. The study used BEER approach as it allows the estimation of the dynamics of adjustment of exchange rates. The study implements the cross-section augmented distributed lag (CS-ARDL) model was employed, a version of the dynamic common correlated effects (dynamic CCE) estimator. The cross-sectional distributed lag (CS-DL) model which is in addition robust to small sample bias was used as well. The results revealed that the two fundamentals approaches are significant in explaining effective exchange rates although the measure of productivity suggested a positive relationship. the computed results also revealed that exchange rate misalignments using the long-run equilibrium approach provide the medium-run misalignment for robustness. The study concluded that emerging countries specializing in processing trade, have kept their currencies undervalued for competitiveness in the global markets.

Chipote and Makhetha-Kosi (2015) analyzed the impact of Monetary Policy in promoting economic growth in South Africa from 2000 – 2010 and exchange rate was included as one of the control variables. Their study employed the Augmented Dickey-Fuller and Phillips-Perron unit root tests to test for stationarity in the time series. The Johansen co-integration and the Error Correction Mechanism were also employed to detect the short-run and long-run dynamic forces amongst the variables. The results revealed that a long-run relationship existed among the variables. The results also revealed that money supply, repo rate, and exchange rate are insignificant monetary policy instruments that drive growth in South Africa whilst inflation is significant. Thus, exchange rates as one major instrument for monetary policy have no significant effect on economic growth in South Africa.

A study by Acar (2000) analyzed the effects of depreciation on output growth in Less-Developed Countries (LCDs). In this study, 18 countries were used and fixed-effect procedures were employed. These 18 countries were divided into two different categories in which two different regression analysis were carried out. Ten countries group data for both manufacturing product exporters as well as primary product exporters and agriculture were used to estimate a model of real output behavior over a period of 25 years. These two different groups of countries were then examined to see if there exists a qualitative difference between different countries in terms of the effect of devaluation on economic growth. The results show that depreciation creates a contraction effect on output in the first year, whereas it has an expansionary effect in the following year.

Table 3.1 Summarized findings from previous studies

AUTHOR/S	PERIOD	DATA	METHOD USED	RESULTS
POLODOO (2010)	1999 – 2010	Panel data	Z-score	positive effect
FRENKEL AND RAPETTI (2012)	-	Panel data		Positive effect
SCHNABL (2007)	1994 – 2005	Panel data	GLS & GMM	positive effect
CHIPOTE AND MAKHETA-KOSI	2000 – 2010	Time series	ECM	No effect
HOLLAND ET .AL (2013)	1970-2009	Panel data	ARIMA	Negative effect
MASUNDA (2011)	1980-2003	Time series	GLS & GMM	Positive effect
AZEE (2011)	1986 – 2010	Time series	OLS	Negative effect
CLARK (1973)	1970 – 1974	Time series	Log level model	Negative effect
ACAR (2000)	1970 – 1995	Panel series	Regression VECM	Positive effect
BREITENBACH, TIPOY AND ZERIHUN (2016)	1980 - 2013	Time series	CS-ARDL	Positive effect

Source: Compiled by the Author

3.3. Chapter Summary

An overview of the empirical literature reviewed as summarized in Table 3.1, shows that there is no consensus on the role of exchange rates, trade and other macroeconomic variables on economic growth. Various studies have produced mixed and conflicting results on the link between exchange rates, macroeconomic variables, and economic growth[7]. There is a gap in the existing literature which called for an investigation as most emerging economies are hindered by a series of exchange rate variations. In addition, Empirical studies are yielding different results because of different methods and tests used. For instance, Polodoo (2010) used panel data and employed the Z-score method and the results showed a negative relationship. Holland et. al's (2013) results contradict with the findings of Polodoo as illustrated in Table 2.1. In addition, most studies on the relationship between exchange rate and economic growth vary depending on the models used, data available and macroeconomic environment under consideration. Thus, the

[7] See Table 3.1 for summarized conflicting findings from previous researches on the role played by exchange rates and other macroeconomic variables on economic growth

debate on the true link between exchange rate and economic growth is an ongoing concern, implying the need for further analysis on the impact of exchange rate levels on economic growth for South Africa.

CHAPTER 4

METHODOLOGY

4.1. Introduction

This chapter presents the empirical framework and the statistical methods to be used in this study. The first part illustrates empirical foundation of the model and then specifies the model that will be used to examine the role of exchange rates in economic growth in South Africa from 1994: Q1 to 2015: Q4. This chapter also includes confirmation of data sources, research techniques, and diagnostic tests employed in the study. The Model specification is explained below,

4.2. Model Specification and Definition of Variables

The study used a simple econometric form equation to examine the role of exchange rate on economic growth in South Africa. This model relied on the growth model specified by Chipote and Makhetha-Kosi (2014) to analyze the impact of monetary policy on economic growth in South Africa. The main difference between this study and Chipote and Makhetha-Kosi's study is that this study included foreign direct investment, interest rates, and fixed capital formation as other two control variables. Chipote and Makhetha-Kosi only used Consumer Price Index and REPO Rate as control variables. The model specifies the growth rate as a function of Real Exchange rate, Foreign Direct Investment, Fixed Capital Formation, Interest Rates and Money Supply. The model is specified as follows:

y = f (RER, MS, FDI, FCF, INT) ……………………………………………………………….4.1

Where:

y denotes real GDP as a proxy for economic growth

RER denotes real effective exchange rates (measured as a value of a domestic currency against a basket of other currencies).

FDI denotes foreign direct investments from one country into another expressed in the total value of assets owned in one country by an entity based in another country measured as a ratio to GDP.

FCF denotes ratio of fixed capital formation to GDP

INT denotes interest rates (prime lending rate).

Ms denotes the ratio of gross aggregate money supply to GDP

Several growth models use different macroeconomic variables to assess the relationship between exchange rate and economic growth. According to Alfaro, Chanda, Kalemli-Ozcan, and Sayek

(2006), Foreign Direct Investment (FDI) promotes growth through backward linkages and the increase in the number of varieties of investments which leads to positive spillovers in the economy. Theoretically, foreign direct investment enhances economic growth through improvement in technology, construction, and productivity. To discover the true effect of FDI on economic growth, FDI is used as one of the explanatory variables in the study. Therefore, the study adds foreign direct investment (FDI) and Fixed Capital Formation (FCF) in the growth model.

Output (y) represents percentage change of output in the economy. Hence, growth is conventionally measured as the percentage changes in total output or real GDP. Therefore, (y) represents economic growth, which is the dependent variable representing growth rate at a given period. According to Karabell (2012), change in GDP is a satisfactory measure of the economic growth of industrial economies that make finished goods and services within an economy.

Interest rates affect business activities in the economy and improving business activities lead to economic growth. According to Pettinger (2013), an increase in interest rates will affect borrowing decisions hence economic growth. In the classical theory, the appropriate pricing strategy in the banking sector enhances proper determination of real interest rate (Backus and Roubini, 1998). Thus, the study includes real interest rate as it affects borrowing decisions and investments in the economy.

The real exchange rate is the main explanatory variable as the study strives to reveal the role exchange rates play in the economy. The fixed capital formation is regarded as one major element that affects growth. Pettinger (2013) postulates that FCF plays a crucial role as it refers to the net increase in physical assets (investment minus disposals) within the measurement period as a total percentage of government expenditure on GDP in the economy. Government expenditure denotes the effect of fiscal policy stance in the economy.

The econometrical form of equation 4.1 is then presented to meet the objectives of the study as follows:

$$Y_t = \beta_0 + \beta_1 RER_t + \beta_2 FDI_t + \beta_3 FCF_t + \beta_4 INT_t + \beta_5 Ms_t + \mathcal{E} \quad \ldots\ldots 4.2$$

Where:

β_0: the intercept

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$: the coefficients of the explanatory variables

$\mathcal{E}$ denotes the error term which represents omitted variables in the specified model.

To obtain elasticity coefficients and remove the effects of outliers, the variables of the study are transformed into logarithms.

$$Ln\ y_t = \beta_0 + \beta_1\ lnRER_t + \beta_2\ lnFDI_t + \beta_3\ ln\ FCF_t + \beta_4\ ln\ INT_t + \beta_5\ ln\ Ms_t + \varepsilon \ldots\ldots\ldots\ldots 4.3$$

.

Logarithmic transformations are very important when dealing with economic time series, which exhibits a strong long-run trend (Asteriou and Hall, 2007).

4.3. Prior Expectations on the growth model

β_1 is a parameter that captures the effect of real exchange rate on economic growth and the sign of this parameter is important to this study. The sign cannot be predetermined as there are mixed views in the empirical literature. If there is a positive relationship between economic growth and exchange rate β_1 should be positive while a negative relationship is indicated by a negative β_1. β_2 is expected to be positive because foreign direct investment affects output positively. β_3 is expected to be positive since the increase in fixed capital formation influence economic growth positively. An increase in real interest rates increases the cost of capital so β_4 is expected to be negative since an increase in the cost of capital increases cost of production and output decreases. β_5 is expected to be positive since an increase in money supply increases consumption hence capital stock and helps to improve social and economic development.

4.4. Definition of variables

- **Real exchange rates**

The real exchange rate used in the study is a ratio of the price level abroad and the domestic price level, where the foreign price level is converted into domestic currency units. Real exchange rate = eP*/P, (e is the nominal ZAR/USD exchange rate, P* is the average price of a good in the South Africa, and P is the average price of the good in the United States).

- **Economic growth**

Economic growth (y) denotes growth rate which is a change in annual real GDP (at constant prices).

- **Real interest rate**

The study employs the prime lending rate which reflects the true interest rate which the households, firms, and the government are charged when they borrow funds from various commercial banks. The real interest rate is the nominal interest rate adjusted for actual inflation.

- **Aggregate money supply**

Aggregate money supply M3 constitutes M2 plus all long-term deposits with monetary banking institutions. M3 is measured as the ratio of aggregate money supply to GDP.

- **Foreign direct investment**

FDI is the sum of inflows of equity capital, reinvestment of earnings, and other short and long-term capital inflows into the economy as recorded in the balance of payments. FDI is measured as the ratio of foreign direct investment to GDP

- **Fixed capital formation**

Gross fixed capital formation is calculated in billion Rands. It is measured as a ratio of governments' total spending on public and private infrastructure to GDP.

4.5. Data Sources and Time Domain

The data used in the study are quarterly data for the period 1994: Q1 to 2015: Q4, giving a sum of 84-time series observations. Relevant data was mainly collected from the South African Reserve Bank (SARB), Department of Trade and Industry (DTI), Trading Economics and Statistics South Africa (StatsSA) Quarterly Bulletin.

4.5.1. Estimation Techniques

Prior to the estimation techniques, tests for unit root are carried out using Augmented Dickey-Fuller (ADF) unit root tests. Conducting tests for a unit root is important when dealing with time series data. If the data is not stationary, the results obtained will have no meaning and this can lead to incorrect conclusions (Asteriou and Hall, 2007). Kennedy (2013) posits that using data which is not stationary leads to spurious and meaningless results. Therefore, ADF unit root tests were conducted to check if the data was stationary. To confirm the results obtained under ADF test, Phillips-Perron test was carried out as a confirmatory test. Asteriou and Hall (2007) posit that Phillip and Perron (1988) developed a generalized version of the ADF test procedure that allows for mild assumptions on distributing errors (see also Phillips –Perron 1988). Johansen-Juselius (1992) methods of cointegration testing approach are used to test if variables in the study are cointegrated. If variables cointegrate with the same order, Error Correction Modeling and Diagnostic Testing are then carried out.

4.5.1.1. Stationarity Tests

Stationarity is a process in which statistical parameters which are the standard deviation and the mean of the series do not vary with time (Sibanda, 2012). As assumed in the classical regression model that both the explained and the explanatory variables should be stationary and the errors have a zero mean and finite variance. The effects of non-stationarity include spurious regression, high R^2 and low Durbin-Watson (DW) statistic (Gujarati, 2004). Below are basic reasons why data must be tested for non-stationarity. First and foremost, non-stationary series can affect the series' performance and properties. For instance, persistence shocks will be infinite for non-stationary series. Secondly, if two variables are trending over time, a regression of one, on the other hand, could have a high R^2 even if the two are totally unrelated and this is known as spurious regression. Thirdly, if the variables in the regression model are not stationary, then it can be proved that the standard assumptions for asymptotic analysis will be rendered invalid.

4.5.1.2. Augmented Dickey-Fuller (ADF) test

The unit root test helps in avoiding the problem of spurious regression (meaningless results). Thus, the study made use of a stationarity test which is required when dealing with time series data in econometrics. According to Econterms (2015), the Dickey-Fuller test is used to determine whether a unit root, a feature that can cause issues in statistical inference, is presented in an autoregressive model. Thus, to check whether variables have a unit root or, equivalently, that variables follow a random walk. Hamilton (1994) describes the best case to which the Augmented Dickey–Fuller test can be applied. Thus, the null hypothesis is always that the variable has a unit root.

The study used the Augmented Dickey-Fuller test as expressed by Hamilton (1994) and the true model is shown as follows:

$$y_t = \alpha + y_{t-1} + \mu_t \quad \text{……4.4}$$

Where:

where μ_t is an independently and identically distributed zero-mean error term. In this case, Hamilton (1994) presented the test in different cases as follows, in cases one and two, presumably $\alpha = 0$, which is a random walk without drift. In cases three and four, the test allows for a drift term by letting α be unrestricted.

The Dickey–Fuller test involves fitting the model as expressed below:

$$y_t = \alpha + \rho y_{t-1} + \delta_t + \mu_t \quad \text{……4.5}$$

By ordinary least squares (OLS), perhaps setting $\alpha = 0$ or $\delta = 0$ in equation 4.5. Hamilton (1994) mentioned that such a regression is likely to be plagued by serial correlation. Therefore, to control for that, the augmented Dickey–Fuller test instead fits a model of the form:

$$\Delta y_t = \alpha + \beta y_{t-1} + \delta_t + \zeta 1 \Delta y_{t-1} + \zeta 2 \Delta y_{t-2} + \cdots + \zeta k \Delta y_{t-k} + \varepsilon_t \ldots\ldots\ldots\ldots 4.6$$

Where: k is the number of lags specified in the lags option. The no-constant option removes the constant term α from this regression, and the trend option includes the time trend δ_t, which by default is not included. Testing $\beta = 0$ is equivalent to testing $\rho = 1$, or, equivalently, that y_t follows a unit root process.

- In the first case, the null hypothesis is that y_t follows a random walk without drift, and (4.6) is fit without the constant term α and the time trend δ_t.
- The second case has the same null hypothesis as the first, except that the study includes α in the regression. In both cases, the population value of α is zero under the null hypothesis.
- In the third case, the study hypothesizes that y_t follows a unit root with drift so that the population value of α is non-zero; we do not include the time trend in the regression.
- Finally, in the fourth case, the null hypothesis is that y_t follows a unit root with or without drift so that α is unrestricted, and the study includes a time trend in the regression.

Therefore, null hypothesis to be tested is H_0: α_1=0 against the alternative thatH_1: α_1< 0. The rule of thumb under unit root test states that the calculated t-statistic is identified as the t-statistic and does not follow the standard t-distribution because the variance is infinite. As such, if the absolute value of the calculated t-statistic is less than the critical value, the series has a unit root, whereas if it is greater than the ADF critical value, we do not reject the null hypothesis which outlines that the given time series is stationary (Gujarati and Porter, 2010).

4.5.1.3. Phillips-Perron (PP) Tests

A more comprehensive procedure for unit root nonstationary test is the Phillip-Perron tests. As stated in Gujarati (2004), non-parametric statistical methods are used in Phillip-Perron test to take care of the serial correlation in the error terms without adding lagged difference term. Gujarati and Porter (2010) posits that PP tests are similar to ADF tests because they both incorporate an automatic correction to the DF procedure to allow for autocorrelated residuals. Thus, the study employs PP test as a confirmatory test to ADF as it often gives the same conclusions as ADF and they both suffer from the same important limitations.

4.5.1.4. Cointegration Test and Vector Error Correction Model

The use of time series data necessitates checking if the individual time series are either stationary or that the data is co-integrated in the same order. Gujarati and Porter (2010) argue that non-cointegrated and non-stationary lead to the chance of engaging in spurious (or nonsense) regression analysis. If two series appear to move together over time, it recommends that there exists an equilibrium relationship. If equilibrium relationship exists, it shows that even though the variables have a unit root in the short-run, if they are co-integrated, they will move closely together over time and become stationary after first differencing.

The vector autoregressive (VAR) model is used to describe the dynamic interrelationship among variables that are stationary. Dolado, Gonzalo, and Marmol (2007) state that if the time series have a unit root, then the VAR framework needs to be modified to allow consistent estimation of the relationships among the series. The vector error correction model (VECM) is just a special case of the VAR for variables that are stationary in their differences (for instance, I (1)). The VECM can also take into account any cointegration relationships among the variables.

In order to justify the use of VECM, there is need to test for cointegration. A VECM is intended for use with non-stationary series that are known to be cointegrated. Brooks (2008) contends that the VECM has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. Gujarati and Porter (2010) also states that the cointegration term is known as the correction term since the deviation from long-run equilibrium is corrected gradually through a series of estimated partial short-run adjustments. Thus, the presence of a cointegration relation(s) forms the basis of the vector error correction model (VECM) specification.

There are several methods of testing for cointegration, but two often stand above the rest namely the Engle-Granger approach which is residual based, and the Johansen and Julius (1990) technique which is based on maximum likelihood estimation on a VAR system. Brooks (2008) argues that the problems of the Engle-Granger approach include lack of power in unit root tests, simultaneous equation bias and the impossibility of performing hypothesis tests about the actual cointegration relationships.

In light of the above-mentioned shortfalls of the Engle-Granger approach, this study applies the vector error correction modeling (VECM) by Johansen (1991; 1995). The rationale being that this approach applies maximum likelihood estimation to a vector error correction (VEC) model to simultaneously determine the long-run and short-run determinants of the dependent variable in a model. This approach also provides the speed of adjustment coefficient, which measures the speed at which Gross Domestic Product reverts to its equilibrium following a short-term shock to the system (Greene, 2000).

4.5.2. Johansen Technique Based on VARS

Johansen technique based on VARS follows steps as given below:

Step 1: All the variables should be integrated at the same order before proceeding with the cointegration test.

Step 2: This step involves setting the appropriate lag length of the model. The step also involves the estimation of the model and the determination of the rank of Π.

Step 3: With regards to the deterministic components in the multivariate system, the choice of the appropriate model is made. An analysis of the normalized cointegrating vector(s) and speed of adjustment coefficients is made.

Step 4: Step 4 includes the determination of the number of cointegrating vectors. Causality tests on the error correction model to identify a structural model and determine whether the estimated model is reasonable is done in this last step.

After ascertaining the existence of cointegrating relationships, the vector error correction model (VECM) is estimated to test for the short-run dynamics. The estimated model used in the study is as follows:

$$\Delta Ln\ y_t = \beta_0 + \beta_{y1}\Delta Ln\ y_{t-1} + \ldots\ldots + \Delta Ln\ y_{t-p} ++ \beta_1\ \Delta lnRER_t + \beta_2\,\Delta ln\ FDI_t + \beta_3\ ln\Delta\ FCF_t + \beta_4\ ln\ \Delta INT_t + \beta_5\ ln\ \Delta Ms_t - \lambda_y\ (Lny_{t-1} - \beta_0 - \beta_1\Delta\ lnRER_t - \beta_2\Delta\ lnFDI_t - \beta_3\Delta ln\ FCF_t - \beta_4\ \Delta ln\ INT_t - \beta_5\Delta\ ln\ Ms_t) + \varepsilon \ldots\ldots 4.7$$

Where: $Ln\ y_t = \beta_0 + \beta_1\ lnRER_t + \beta_2\ lnFDI_t + \beta_3\ ln\ FCF_t + \beta_4\ ln\ INT_t + \beta_5\ ln\ Ms_t + \varepsilon$ is the long-run cointegrating relationship between the dependent variable Lny_t and *control variables lnRERt ,* $lnFDI_t$, $ln\ FCF_t$, $ln\ INT_t$, $ln\ Ms_t$ and λ_y error-correction parameters that measure how Lny_t and control variables reacts to deviations from long-run equilibrium.

4.5.3. Impulse Response Analysis

The impulse response is a popular way of summarizing the information in a time series model (Sibanda, 2012). The function measures the effects of unexpected shocks on current and future values of a time series variables.

Mwabutwa (2013) postulates that if the central bank unexpectedly raises interest rates or change the money supply, then this influences key macroeconomic variables such as inflation or economic growth. Therefore, it is very important to know the magnitude of such effects for both the present and the near future. That is why this study will seek to show the sign, magnitude, and persistence of real and nominal shocks all control variables to the real growth. In addition, Brooks (2008) states that impulse response analysis is applied on the VECM and, if the system is stable, the shock should gradually die away. This study applies the generalized impulse response analysis. Lutkepohl (1993), cited in Rusike (2007), explains that this approach fully considers historical patterns of correlations amongst the different shocks.

4.5.4. Variance Decomposition Analysis

Variance Decomposition analysis breaks down the variance of the forecast error for each variable into components that can be attributed to each of the endogenous variables (Lutkepohl, 1993). Further information on the link between economic growth and exchange rates is found using the variance decomposition analysis. Therefore, the study made use of VD analysis to provide the proportion of movements in the economic growth that is due to its own shocks, against shocks to other control variables.

4.5.5. Diagnostic test

Diagnostic test check was employed to check goodness of fit of the model of the study. Asteriou and Hall (2007) posit that a diagnostic test is carried out to establish the suitability of the model for estimations and as such several diagnostic tests will be carried out. For regression specification, heteroscedasticity of the residuals, normality test, the Ramsey (1969) Regression Equation Specification Error Test (RESET), White Test and Bera-Jarque (1980) are carried out respectively. The RESET test is a general specification test for the linear regression model and it tests whether non-linear combinations of the fitted values help explain the response variable in the model. A test for autocorrelation is carried out in which LM-test is used to detect the presence of autocorrelation. The White Test is carried out with one degree of freedom. In addition, the test for normality uses the Bera-Jarque (1980) test with a chi-square distribution with two degrees of freedom.

4.5.6. Descriptive statistics of the variables

In addition to the diagnostic test, the study makes use of the descriptive statistics. The most important aspects of the descriptive statistics are kurtosis, skewness, mean and median and the Jarque-Bera (J-B).[8] The skewness measures the symmetry of the distribution of the series around its mean. Positive skewness implies that the distribution has a long right tail, whereas a negative skewness means the distribution has a long left tail. Kurtosis measures how flat or how the distribution of the series is peaked (Gujarati, 2004). It measures whether the data is heavy-tailed or light-tailed comparative to a normal distribution. That is, data sets with high kurtosis tend to have heavy tails or outliers. Data sets with low kurtosis tend to have light tails or lack of outliers. An even distribution can be the extreme case. To check if data series approximate the normal distribution, it is important to evaluate informally by checking the results and see whether the mean and the median are approximately equal and the skewness is approximately zero, and the kurtosis is close to 3. The Jaque-Bera test statistic is for testing if the series is normally distributed. Thus, Jarque–Bera test is a goodness-of-fit test of whether sample data has the skewness and kurtosis matching a normal distribution. In the case of central tendency, the mean (average), median (midpoint) and the mode (most frequently occurring number) are analyzed in the following chapter.

4.6. Chapter Summary

This chapter forms the foundation of the study and it presented the methodology, model formulation, and data analysis. The chapter was guided by theoretical literature and empirical evidence to specify the model to be used in the study. The dependent variable is economic growth and the main explanatory variable is the real effective exchange rate. Other explanatory variables as suggested by the theory are a foreign direct investment and broad money supply M_3. The chapter highlighted different data analysis techniques which will be used in the study. Diagnostic testing models were defined to minimize errors and to obtain meaningful results and unit root testing to minimize the risk of obtaining spurious results.

[8] Jarque-Bera test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution, see the E-views user guide.

CHAPTER FIVE

Estimations and results

5. Introduction

This chapter presents interprets and analyzes the results from econometric estimations of the empirical model applied in the study. The chapter is divided into different subsections which give a set of statistics describing the basic features of the data in the study. Together with simple graphic analysis, they form the basis of virtually every quantitative analysis. One of the sections detail the findings of the unit root tests applied to the set of data employed in the study to determine the time series properties of individual variables. Cointegration analysis is presented as well and it was used to determine the existence of a long-run relationship between the explanatory variables and explained variable in the model. The vector error correction model (VECM) is included in the tests carried out in this chapter. Diagnostic tests, variance decomposition, and impulse response sections are also presented.

5.1. Descriptive statistics of the variables

To check for the goodness of fit of the model in the study the results are presented in Table 5.1.

Table 5.1 Descriptive statistics

	Y_GROWTH	*FCF*	*FDI*	*INT*	*M3*	*RER_EXCHANGE*
Mean	3.047619	0.168718	0.054563	13.6667	0.451623	7.08943
Median	3.25	0.164243	0.047773	13.25	0.384564	7.0844
Maximum	7.1	0.228735	0.133415	25.5	0.897716	11.5467
Minimum	-2.6	0.001432	0.00041	1.5	0.002771	3.4535
Std.Dev	1.797151	0.037622	0.040042	4.343728	0.26017	2.091731
Skewness	-0.612578	-1.665684	0.363356	0.274227	0.226142	0.181656
Kurtosis	3.713797	8.789129	1.956515	2.825054	1.627399	2.557964
Jarque-Bera	(7.036802)	(156.1421)	(5.659401)	(1.159923)	(7.31008)	(7.036802)
Probability	0.209647	0.00000	0.059031	0.04992	0.02586	0.029647

Source: *Results compiled by Author from Eviews output. (Jarque-bera Probability statistics are in parenthesis.*

The results indicate that the mean and median values of the variables Y_GROWTH, FCF, INT and RER_EXCHANGE are approximately equal. Thus GDP growth rate has a mean 3.04

median of 3.25. Similarly, RER_exchange has a mean of 7.08 and median of 7.08, and INT has 13.7 mean and 13.2 medians.[9] This implies that the time series matches a normal distribution. As for Jarque-Bera, the J-B probability is reported and it refers to the probability that the J-B statistic is greater (absolute term) than the observed value under the null hypothesis of a normal distribution. A small probability value (less than 0.05) leads to the rejection of the null hypothesis of a normal distribution. Table 5.1 shows the results of all variables under consideration and y_growth and FCF are negatively skewed while INT, FDI, M3, and RER_exchange is positively skewed. Y_growth and FCF are peaked relative to the normal distribution. The reported probability is that of the Jarque-bera and it refers to the probability that the J-B statistic is greater (in absolute terms) than the observed value under the null hypothesis of the normal distribution. With exception of FCF, INT, M3 and RER_exchange, other variables are normally distributed.
In order to check if variables are correlated, the study used the Pairwise Correlation test which is a standard practice for pairwise comparisons with correlated observations. Correlation analysis measures the relationship between observations within the specified model and itself over a specified time interval (Gujarati, 2004). The results from the pairwise correlation analysis are used to compare each pair of means. The results are presented in Table 5.2 below.

Table 5.2: Pairwise Correlation Results

	Y_GROWTH	***FCF***	***FDI***	***INT***	***M3***	***RER_EXCHANGE***
Y_GROWTH	1.0000					
FCF	0.825990 (13.34989) 0.0000	1.0000 --------- ---------				
FDI	0.658353 (7.968393) 0.0000	0.886152 (17.42193) 0.0000	1.0000 --------- ---------			
INT	-0.809885 (12.57848) 0.0000	0.900963 (18.91736) 0.0000	0.635015 (7.489021) 0.0000	1.0000 --------- ---------		
M3	0.691733 (8.726656) 0.0000	0.936676 (24.36773) 0.0000	0.982172 (47.60022) 0.0000	0.724293 (9.570335) 0.0000	1.0000 --------- ---------	
RER_EXCHANGE	-0.798047 (12.06542) 0.0000	0.961331 (31.80219) 0.0000	0.895627 (18.34406) 0.0000	0.870759 (16.13349) 0.0000	0.923336 (21.90663) 0.0000	1.0000 --------- ---------

Source: *Results compiled by Author from Eviews output. (t-statistics are in parenthesis).*

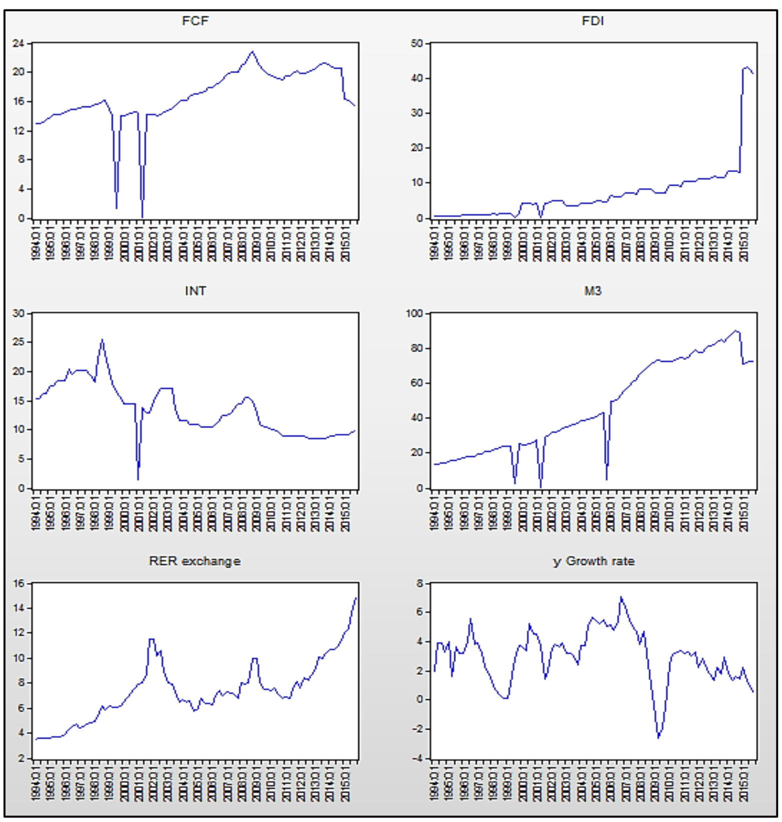
[9] Other results are indicated in table 5.1 above.

The results indicate that all variables are statistically significant since all t-statistics are greater than 2 with probabilities less than 5%. FCF and RER_EXCHANGE have 13.34989 and 12.06542 t–statistics values respectively. From the pairwise results, it is detected that FCF is highly correlated with Y_GROWTH followed by INT then RER_EXCHANGE. FCF, M3, and FDI are positively correlated with Y_GROWTH. This supports theoretical underpinnings which suggest that increase in government investments and foreign direct investments have expansionary effects on economic growth. INT and RER_EXCHANGE are negatively correlated with Y_ GROWTH rate as shown in Table 5.2 above. This shows that increase in real interest rate and exchange rate (currency appreciation) leads to decrease in Y_GROWTH.

5.2. Unit root/ stationarity test results

The study made use of informal graphical presentation and formal ADF and PP tests. The graphical results from the test for stationarity are presented in Figure 5.1 (a and b) below.

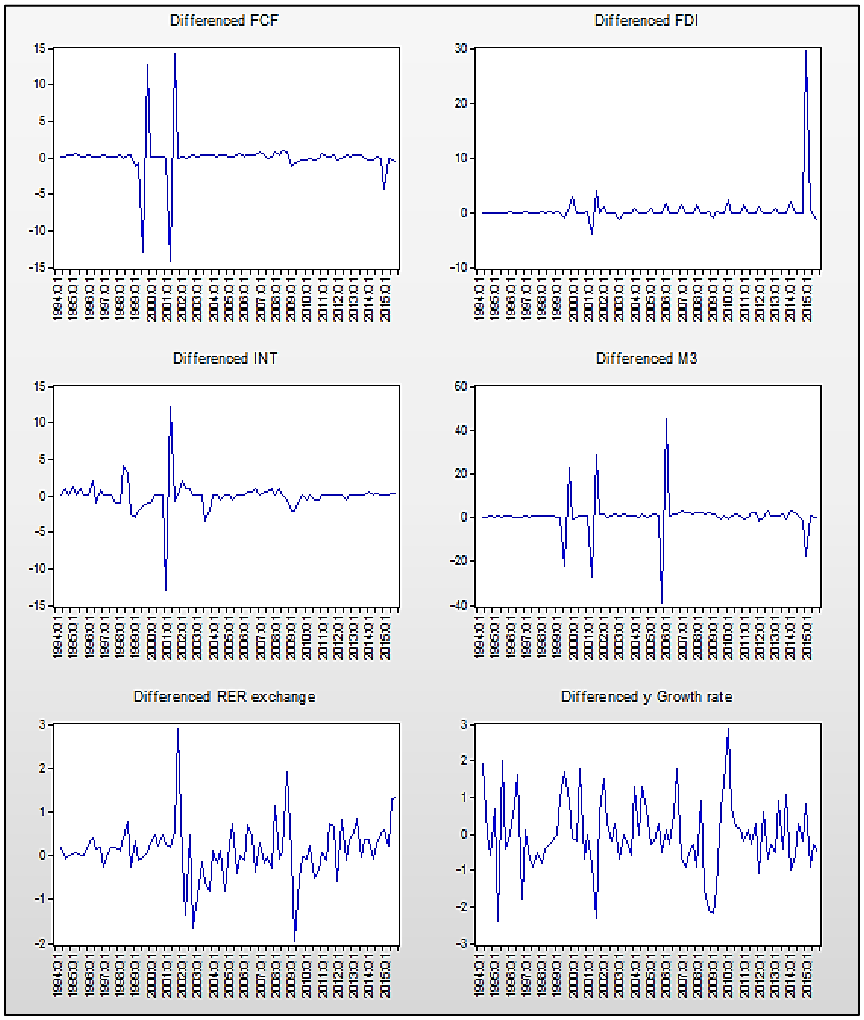
Figure 5.1 (a) (Plot of variables in Levels for 1994: Q1 – 2015: Q4



Source: *Eviews 9.5. Undifferenced: Results compiled by Author from Eviews output.*

As presented in Figure 5.1(a), Foreign Direct Investment (FDI) has an upward trending pattern unlike other variables such as interest rates (INT) and economic growth (y Growth rate) which portray a fluctuating trend. FCF shows a deep downward trend from 2002-2004 followed by and upward/ growth trend from 2004 thereafter. FDI shows a constant trend until 2002 followed by a temporary increase in 2003, a sharp decrease in 2004 and growth trend thereafter. FCF, INT and M3 show a fluctuating trend especially in 2000, 2002 and 2008. The series in levels are clearly non-stationary. Figure 5.1 (b) shows that the data that fluctuates around the zero mean indicates the absence of unit root, hence stationary time series data.

Figure 5.1(b) Plot of first differenced variables for 1994: Q1-2015: Q4



Source: *Eviews 9.5 Differenced. Results compiled by Author from Eviews output.*

In conclusion, Figure 5.1(a) shows series before differencing and the results show the presence of unit root, that is, the data is non-stationary with non-zero mean. The study, therefore, concludes that differenced variables in figure 5.1(b) shows all that time series data is stationary after differencing and the data is stationary integrated of the same order. The informal method, however, does not give concrete evidence that data is stationary. Thus, this necessitates the need for a more formal method to confirm if variables are indeed stationary. Subsequently, formal tests were conducted to support findings from the graphical findings. This was accomplished through Augmented Dickey-Fuller and the Phillips-Peron tests and the results are presented in Table 5.3.

Table 5.3: Unit Root Test: Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP)

Order of integration	***Variables***	***Augmented Dickey-Fuller (ADF)***			***Phillips-Perron Results (PP)***		
		intercept	Trend & intercept	None	intercept	Trend & intercept	None
LEVEL	L FCF	2.8358	3.0690	0.1132	2.0290	3.2214	0.6125
1ST DIFFERENCE	D FCF	6.5185***	6.4754***	6.556 ***	11.064***	11.901***	10.210***
LEVEL	L RER_exchange	1.8746	2.4251	1.0614	1.5920	2.1052	1.3101
1ST DIFFERENCE	D RER_exchange	3.631***	3.627***	3.362***	8.142***	8.096***	7.977***
LEVEL	LM3	1.544	3.085	0.539	2.333	2.010	0.138
1ST DIFFERENCE	DM3	6.452***	6.407***	6.385***	10.142***	10.976***	9.041***
LEVEL	LINT	2.169	3.326	0.629	2.814	3.010	0.610
1ST DIFFERENCE	DINT	7.567***	7.520***	7.595***	12.348***	12.231***	11.414***
LEVEL	LFDI	1.371	4.550	0.051	3.039	3.069	1.287
1ST DIFFERENCE	DFDI	7.104***	7.070***	6.861***	18.958***	18.830***	18.634***
LEVEL	LY_GROWTH	2.694	2.721	1.312	2.967	3.043	1.443
1st DIFFERENCE	LY_GROWTH	4.952***	4.954***	4.990***	8.302***	8.245***	8.350***
1%	Critical values	3.512	4.074	2.593	3.512	4.074	2.593
5%		2.897	3.466	1.945	2.897	3.466	1.945
10%		2.586	3.159	1.614	2.586	3.159	1.614
Values marked with a *** represent stationary variables at 1% significance level, and ** represent stationary at 5%.							

Source: *Eviews 9.5. ADF and PP tests, Results compiled by Author from Eviews output.*

Table 5.3 above shows the results for Augmented Dickey-Fuller (ADF) test and Philip-Perron (PP) results respectively. Analyzing and commenting on the results, both ADF and PP tests were carried out under the null hypothesis **(H_o)** assumed to have a unit root (non-stationary) against the alternative Hypothesis **(H_1)** which claims that the series is stationary. The computed statistics of ADF and PP were compared with the critical values obtained. Dickey and Fuller (1979) and Perron (1990) speculate that if the calculated static value is greater than the critical, then one must reject the null hypothesis that the series has a unit root, thus, confirming that the series is stationary. The ADF tests variables are presented in Table 5.3 under (a) intercepts, (b) trends and intercepts and (c) no trend and no intercept. The calculated statistics show that for variables in levels in ADF and PP tests were not stationary in intercept, trend, and intercept as the calculated test statistics are less than the critical values in absolute terms. However, all variables after 1st differencing became stationary as the calculated statistics are greater than the critical values under 1%, 5% and 10% in absolute values as presented in Table 5.3. If variables become stationary after first differencing it implies that all variables are integrated at the same order I (1) (Engle and Granger, 1987).

In relation to Phillips-Peron results, for variables in levels, intercept, trend and intercept, none revealed that all the variables had a unit root. All variables on intercept became stationary at 1% significance level after first differencing. On trend and intercept, all variables were non-stationary in levels but all became stationary on trend and intercept were stationary at 1% significance level after first differencing. For the test under no trend and no intercept, all variables in levels were non-stationary. When first differenced, all the variables were stationary at 1% significance. ADF and Phillip-Perron tests tested for stationarity and both tests revealed that the data series were nonstationary in levels and became stationary when first differenced. Therefore, the series were integrated at the same order (1). Once variables are integrated at the same order, the use of cointegration analysis is justified and Johansen Approach was used in this study as presented below.

5.3. Tests for cointegration (Johansen Approach)

After establishing that all variables were stationary and integrated of the same order, the next procedure performed was cointegration tests which determine whether there exists long-run relationship amongst the variables. Asteriou and Hall (2007) suggest that it is important to determine whether there exists a long-run equilibrium relationship amongst the variables if the variables are integrated at the same order. If there exists a stationary linear combination of nonstationary random variables, all the variables combined are said to be cointegrated (Khondker, et al., 2012). Thus, the study uses Johansen cointegration as a way of examining the long-run relationship between the dependent variable (economic growth) and control variables (money supply, interest rates, real exchange rate, fixed capital formation and foreign direct investment).

It is crucial to evaluate whether there is a long-run relationship between the growth and the determinants to have results which make economic sense and conclusion to be reached from the results obtained.

The study uses Lag Order Selection Criteria and the results are presented in Table 5.4. It is a condition for the use of the Johansen technique to indicate the lag order and the deterministic trend assumptions of the VAR. To choose the lag order for the Johansen technique, the Akaike Information Criterion (AIC) is applied in this study. The AIC measures the relative quality of statistical models for a given set of time series data (Asteriou and Hall, 2007). Given an econometric model, the AIC can estimate the quality of the model. Thus, AIC provides a means for model specification as it offers a relative estimate of the information lost when a given model is used to represent the process that creates the data. In doing so, it deals with the trade-off between the goodness of fit of the model and the intricacy of the model. Table 5.4 presents the lag lengths selected by different information criteria.

Table 5.4. Lag Order Selection Criteria

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-335.910944	NA	0.000152	8.238818	8.413674	8.309065
1	-56.461855	511.7622	4.33e-07	2.372575	3.596566*	2.864306*
2	-16.919228	66.69841	4.03e-07	2.287210	4.560338	3.200426
3	23.525211	62.37215	3.75e-07	2.180115	5.502378	3.514815
4	57.689388	47.74753	4.18e-07	2.224352	6.595751	3.980535
5	122.561356	81.28536*	2.33e-07*	1.528642*	6.949176	3.706309

Source: *Results compiled by Author from Eviews output.*

* indicates lag order selected by the criterion
LR: sequentially modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Kneib (2016) suggests that the lower the Akaike Information Criterion (AIC) better the model. Thus, results for lag order selection presented in Table 5.4 above confirms that the criteria selected 5 lag. From Table 5.4 above, 1.528642 under lag 5 is the lowest AIC. In this regard, 5 lag for VAR was chosen and used in the Johansen cointegration test. Having identified the number of lags to use, the Johannsen cointegration test was carried out and the results were presented in Table 5.5.

Table 5.5 Co-Integration Rank Test (Trace results and Maximum-Eigen results

Hypothesized No. of CE(s)	***Trace results***				***Maximum-Eigen results***			
	Eigen Value	**Trace Statistic**	**0.05 Critical Value**	**Prob.****	**Eigen value**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
*None **	0.4355	109.1645	95.7537	0.0043	0.4355	45.7511	40.0776	0.0104
At most 1	0.2640	24.5209	33.876	0.1458	0.2639	24.5210	33.8770	0.4181
At most 2	0.2400	38.8921	47.8921	0.2646	0.2400	21.9557	27.5843	0.2226
At most 3	0.1420	16.9355	29.7971	0.6448	0.1498	12.2533	21.1316	0.5229
At most 4	0.0555	4.6821	15.4947	0.8416	0.0554	4.5664	14.2646	0.7953
At most 5	0.0015	0.1157	3.8415	0.7337	0.0014	0.1157	3.84145	0.7337

Source: *Results compiled by Author from Eviews output.*

Trace test indicates 1 cointegrating Eqn(s) at the 0.05 level
*denotes rejection of the hypothesis at the 0.05 level
**Mackinnon-Haug-Michelis (1999) p-values

Table 5.5 shows the results for Johansen approach for cointegration for both Trace test and Max-Eigen test. According to Baumohl and Lyocsa (2009), the rule of thumb says if the test statistic is greater than the critical value at 5% we do not reject the null hypothesis on the cointegration equation in question. Trace test results reflect that at least one co-integrating equation exists at 5% level of significance. The trace statistic value at none* is greater than critical value at 5% significance level (109.1645 > 95.7537) and p-value (0.0043) is less than 5% level of significance, therefore, we reject the null hypothesis. However, at most 1 cointegrating vector exists since the trace statistic value at most 1 is less than the critical value (24.5209< 33.876) and the p-value (0.1458) is greater than 5% level of significance. For that reason, the Trace statistic specified 1 cointegrating relationship at 5% significance level.

The Max-Eigen test in Table 5.5 also rejected the null hypothesis at none* which indicates that there is no cointegrating vector. The null hypothesis at most 1 cointegration vector is not rejected as the Max-Eigen statistic value (24.5210) is less than the critical value (33.8770). Therefore, it can be concluded that there is one significant long-run relationship between the given variables (using the trace test). Since variables can either have short or long-run effects, a vector error correction model (VECM) is used to disaggregate these effects. The cointegration vector represents the deviations of the endogenous variable from its long-run equilibrium level. The

Cointegration vector (see Appendix 3) results show that over the period 1994: Q1 to 2015: Q4, the deviations of economic growth from equilibrium were stationary and this is critical in its use as an error correction model.

5.4. Error Correction Model (ECM)

Table 5.6: Error Correction Model results

Variable	*Coefficient*	*Standard error*	*t-statistic*	*Probe*
LNRER_EXCHANGE	-4.017227	0.762598	-5.267808	0.0000
LNINT	-0.387820	0.405869	-0.955529	0.3422
LNM3	-0.405327	0.397235	-1.020369	0.3106
LNFDI	1.046545	0.322106	3.249066	0.0017
LNFCF	-0.888499	0.472679	-1.879710	0.0638
RESID01(-1)	0.794793	0.071508	11.114693	0.0000
	R-squared 0.87375; F-statistic 29.3163; DW stat 1.68814			

Source: *Results compiled by Author from Eviews output.*

Results in Table 5.6 show that at least two variables are statistically significant since their probabilities are less than 5%. LNRER-EXCHANGE and LNFDI are statistically significant. The coefficient RESID01 (-1) of 0.79 which measures the speed of adjustment shows approximately 79 percent corrected in the first quarter as the condition in which the economy resorts back to its equilibrium. This indicates strong pressure on economic growth in re-establishing long-run equilibrium every time the economy experiences a shock. The speed of adjustment is statistically significant at 5 percent with an absolute t-value of approximately 11.114693. The fast adjustment by economic growth may reflect a quick response by the economy itself back to equilibrium due to policies in place and quick response by market forces.

In Table 5.6, there is a negative relationship between real exchange rates and economic growth. The results imply that depreciation of the real exchange rates by 1%, decreases economic growth by approximately 4.017%. The outcome contradicts claims by Adejare and Usman (2014); Khondker, et al., (2012); Mtenga (2015) and Galebotswe and Andrias (2009) whose results claim a positive relationship between growth and exchange rate devaluation. As hypothesized in the theory section, exchange rate devaluation has expansionary effects on growth as it boosts exports hence production increases. Exchange depreciation may in some cases be a quick fix in the short-run, but not sustainable in the long-run as it might cause inflation.

FDI in the short-run has a positive impact on growth. A 1% increase in FDI increases growth by approximately 1.047%. An increase in the FDI in the short-run increases capital injections and production in the country and GDP increases respectively. In the long-run, the case cannot be different as more and more capital injections lead to more production and the economy develops leading to economic growth. Real exchange rates and FDI are statistically significant in explaining economic growth in South Africa in the short-run since their respective absolute t-values are above two. The other variables FCF, INT and M3 are statistically insignificant since the t-values are less than 2.

5.5. Vector Error Correction Model (VECM)

The Vector autoregression (VAR) was introduced by Sims (1980) as a technique that could be used by macroeconomists to characterize the joint dynamic behavior of a collection of variables without requiring strong restrictions of the kind needed to identify underlying structural parameters. The finding of a cointegration equation means that a Vector Error Correction Model can be used. The confirmation to use VECM led to the distinction between the long and short-run impacts of variables in order to determine the level and the direction of influence that real exchange rates have on economic growth. Using the results from the Cointegration test, the VECM was estimated. The VECM results are shown in Table 5.7.

TABLE 5.7: Vector Error Correction Model results

Variable	*Coefficient*	*Standard error*	*t-statistic*
Constant	9.098092	-	-
Y_GROWTH RATE	1.000000	-	-
LNRER_EXCHANGE	4.647566	2.14489	2.16681
LNM3	6.144545	1.22233	5.02691
LNINT	-3.160810	1.54691	-2.04331
LNFCF	-11.37790	1.94268	-5.85682
LNFDI	-0.064924	1.02042	-0.06363

Source: *Results compiled by Author from Eviews output.*

Since variables are cointegrated at the same order, this suggests a long-term relationship among the variables under consideration. The long-run relationship between economic growth and control variables for one cointegration vector for South Africa in the period 1994: Q1 – 2015: Q4 is displayed below:

Y_GROWTH RATE = - 9.098092- 4.647566 RER_EXCHANGE - 6.144545 M3 + 3.160810 INT + 11.37790 FCF + 0.064924 FDI ………………………………………………………………5.1

Equation 5.1 was formulated using VAR results as presented in Table 5.7. Equation 5.1 shows that RER_EXCHANGE, M3, and INT have a negative long-run relationship with Y_GROWTH RATE in South Africa. According to Asteriou (2007), it is a condition in statistics that t-statistic value should be greater than 2 in absolute terms for the outcome to be statistically significant. Thus, RER_EXCHANGE, M3, INT and FCF results are statistically significant because they all have absolute t-statistic greater 2. FDI is statistically insignificant as the corresponding t-statistic in less than two. FDI, INT, and FCF indicated a positive long-run relationship with Y_GROWTH RATE. This concurs with the Marshallian Learner Condition and the Keynesian theory which suggests that increase in FDI and government investments in the economy have an expansionary effect on economic growth.

The results show a negative relationship between real exchange rates and economic growth. A unit increase in RER_EXCHANGE which is depreciation of the ZAR against the USD decreases economic growth by 4.6. The long-run relationship between exchange rate differs with the short-run relationship since in the short-run, exchange rate depreciation boosts exports, hence total output. In the long-run, exchange rate depreciation sets in inflation in the economy which has contractionary effects on economic growth. This is in line with Marshallian Learner Condition discussed in chapter three which claims that exchange rate depreciation in the long-run has a contractionary effect on total output in the economy. In addition, the real exchange rate result supports the empirical findings by Sibanda (2012) whose results indicate a negative long-run relationship between real effective exchange rates and economic growth in South Africa. Therefore, exchange rate depreciation in South Africa has contractionary effects on economic growth in the short-run and in the long-run.

The results show that money supply has a negative long-run relationship with economic growth. A unit increase in money supply decreases economic growth by approximately 6.1 in the long-run. Increasing money supply, in the long-run, stimulates demand to pull inflation and inflation discourages investments. The decrease in investments has a contractionary effect on economic growth.

The findings of the study show a positive relationship between FDI and economic growth in the long-run. A unit increase in FDI increases economic growth by approximately 0.06. Results agree with reviewed literature that increases in foreign investments lead to increase in economic growth in developing economies since more investments in technology increase economic growth as suggested in the Solow-Swan growth model in chapter 3. Therefore, more capital injections from investments, in the long-run, increase production and economic growth. Lastly, INT was also found to be positive related to economic growth in the study. A unit increase in INT increases economic growth by 3.1. High interest rates on savings encourage more investments in liquid assets induces more capital. The higher rate of return on investment in an economy increases capital formation.

5.6. Diagnostic Checks

Diagnostic tests were conducted to confirm the validity of the parameter estimates obtained in the economic growth model. To test the fitness of the Growth Model, several tests including normality, serial correlation, autoregressive conditional heteroscedasticity, and stability test were performed on the model. If there is any problem in the residuals from the estimated model, it makes the model inefficient and the estimated parameters biased. Therefore, for this reason, the VAR model was subjected to diagnostic checks. Table 5.8 presents the diagnostic test results which assist in checking for normality, serial correlation, and heteroscedasticity. All diagnostic checks are established on the null hypothesis that there is no serial correlation for the LM test. There is no heteroscedasticity for the White heteroscedasticity test and there is normality for the Jarque-Bera test.

Table 5.8: Diagnostic check results

Test	*Null hypothesis*	*t-statistic*	*Probability*
Lagrange Multiplier (LM)	No Serial correlation	6.590109	0.100801
White (Ch-sq.)	No conditional heteroscedasticity	0.799664	0.553310
Jarque-Bera (JB)	There is a normal distribution	7.451251	0.240980

Source: *Results compiled by Author from Eviews output.*

Table 5.8 presents Diagnostic tests results which show that the test for serial correlation produced LM statistic of 6.590109 with a probability of 0.1008. Jarque-Bera t-statistic 7.451251 and the probability is 0.240980 for the Histogram[10] and Normality Test.

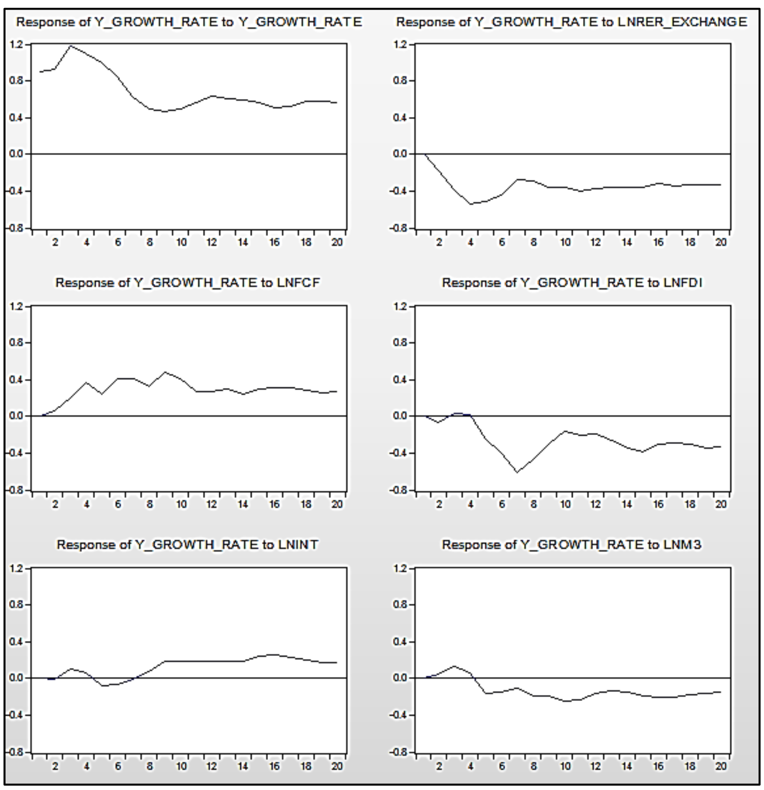
[10] See Appendix 1(b).

The Jarque-Bera test statistic is 7.4512511 which means that the t-statistic is insignificant as it is above 5 percent significance level and its corresponding probability is greater than 5 percent. As such, the null hypothesis of a normal distribution was not rejected. The heteroscedasticity test gave F-statistic of 0.799664 and the probability of 0.5533 and this means that we do not reject the null hypothesis of no heteroskedasticity, and reject the alternative hypothesis of the presence of heteroscedasticity hence the residuals are homoscedastic. Diagnostic test results check for serial correlation and heteroscedasticity shows that the data is behaving well. Results indicate the presence of non-normal residuals; therefore, the model is suitable for forecasting.

5.7. Impulse Response Function (IRF)

The study uses impulse response function as an additional check of the Cointegration test's findings. Impulse response analysis identifies the responsiveness of the dependent variables (endogenous variable) in a VAR to shocks from each of the variables in the series (Gujarati, 2004). Results of the impulse response analysis are presented in Figure 5.2.

Figure 5.2. IMPULSE RESPONSE RESULTS (Response of Y_GROWTH RATE)



Source: *Results compiled by Author from Eviews output.*

According to Rossi (2016), it is important to know the response of one variable to an impulse in another variable in a system with more than one variable. The focus of the study was to assess the role of exchange rate on economic growth in South Africa. Thus, the responses of economic growth to real exchange rates is reported first. The responses of economic growth to itself, M3, FDI, INT, and FCF are reported later. These impulse response functions show a dynamic response of economic growth to a one-period standard deviation shock to change in technology and innovations of the system. The impulse response function also indicates the directions and persistence of the response to each of the shocks over a period of 20 quarters. Importantly, the impulse response functions have the expected pattern and confirm the results from both the short-run and the long-run relationship analysis between the variables of the study.

Shocks to all the variables in the model are significant and some are persistent and some are not. Shock to RER_EXCHANGE has a dampening impact on economic growth and this confirms the error correction results obtained in Table 5.7. RER have a negative impact on economic growth in the first four quarter where the effect is substantial. Nevertheless, after the 4th quarter, thereafter, the shock has a noticeable positive impact on economic growth though growth rate remains negative. Still, as time progresses, the shock dampens economic growth from 7th quarter till 10th quarter. As from 11th quarter, the response became almost stable though economic growth remained negative.

Shocks to FCF show a positive turbulent effect on economic growth as shown in figure 5.2. From the 1st quarter till 4th quarter, the shock depicted a positive response of economic growth to FCF. After the 4th till 5th quarter, the response became negative though economic growth remained positive. This implies that economic growth increased at a decreasing rate. INT shows a turbulent nature with economic growth positive until the second quarter and economic growth responded positively to a one standard deviation positive shock of INT. Nevertheless, the reaction became negative from the 3rd until the 5th quarter and it was negative. Subsequently, the response became positive from the 6th quarter until the 9th quarter where the reaction became stable. Shocks to FDI and M3 have a negative effect on growth until the 5th quarter. Credence is given to M3 from the 1st quarter as the reaction was temporarily positive and became negative thereafter. A noticeable slight swerve on FDI during the 10th quarter shows that the response to economic growth to FDI had a positive effect. Impulse response gave a clearer reaction of economic growth in response to exogenous variables shocks. Different reactions were noticed from the first quarter until the 20th quarter. In addition to these findings, variance decomposition is discussed below.

5.8. Variance Decomposition Analysis

Variance decomposition analysis presents ways of determining the relative significance of shocks in clarifying variations in the variable of interest within the study (Alpanda, Kotzé, and Woglom, 2011). In the study, variance decomposition explains the relative importance of shocks to variables under consideration in explaining variations in economic growth. The results of the variance decomposition analysis are displayed in Table 5.9 below and these show the proportion of the forecast error variance in economic growth as explained by innovations in real exchange rates and its own innovations.

Table 5.9 Variance Decomposition Analysis Results

P	S. E	Y_GROWTH RATE	LNFCF	LNFDI	LNINT	LNM3	RER_EXCHANGE
1	0.97963	100.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1.46295	99.25615	0.31878	0.05039	0.04495	0.23513	0.094601
3	1.93648	96.82527	1.66308	0.35303	0.26688	0.34274	0.548999
4	2.34793	96.03089	2.60977	0.36638	0.28839	0.30683	0.397735
5	2.71107	95.09816	3.31887	0.37136	0.37893	0.24790	0.584748
6	3.03361	94.68846	3.71389	0.39938	0.44956	0.20597	0.542729
7	3.33906	94.46298	4.01101	0.38572	0.46630	0.17225	0.501721
8	3.61636	94.26312	4.26931	0.38737	0.47048	0.15042	0.459290
9	3.87360	94.11993	4.45848	0.39700	0.47526	0.13631	0.413023
10	4.11376	94.01556	4.60243	0.39785	0.47788	0.12470	0.381586
11	4.34001	93.91851	4.72147	0.40016	0.48317	0.11565	0.361039
12	4.55494	93.84535	4.81224	0.40247	0.48785	0.10815	0.343939
13	4.76041	93.78655	4.88752	0.40308	0.49084	0.10166	0.330345
14	4.95741	93.73577	4.95230	0.40416	0.49340	0.096271	0.318096
15	5.14691	93.69327	5.00723	0.40523	0.49545	0.091706	0.307121
16	5.32961	93.65628	5.05505	0.40598	0.49717	0.087756	0.297766
17	5.50624	93.62348	5.09697	0.40674	0.49881	0.084323	0.289668
18	5.67737	93.59480	5.13365	0.40738	0.50027	0.081285	0.282603
19	5.84350	93.56932	5.16625	0.40792	0.50156	0.078579	0.276367
20	6.00504	93.54654	5.19546	0.40842	0.50270	0.076162	0.270753

Source: *Eviews 9.5 Variance Decomposition Output by Robert Hall (2016)*

In order to ascertain the impact of exchange rates and other macroeconomic variables on economic growth for a relatively longer period, the study conducted the variance decompositions for 20 quarters. The 1st quarter shows that all the variance in economic growth is explained by its own improvements (shocks). For the 5th quarter ahead forecast error variance reported in Table 5.9, economic growth itself explains about 95.1 percent of its variation, while the other variables explain only the remaining 4.9 percent. Of the remaining 4.9 percent, FCF explains 3.3 percent, followed by RER which explains approximately 0.58 percent, INT explains only about 0.37 percent, FDI explains 0.37 per cent and M3 explains 0.24.

In the 10-quarter, economic growth explains about 94 percent of its own variation and other variables explain the remaining 6 per cent. The influence of FCF increases to 4.6 percent, from 3.3. INT decreased to 0.47 percent, FDI increased to 0.39 percent, M3 decreased to 0.27 and RER decreased to 0.38 percent. As the period progresses, growth rate explains approximately 93.7 percent while FCF increased to 5 percent. INT and FDI increased to 0.5 and 0.4 respectively. M3 and RER kept on decreasing to 0.09 and 0.31 respectively.

In conclusion, the variance decomposition results are parallel to those from the impulse response analysis in figure 5.2 in that all the variables under consideration have a significant role they play in economic growth in the short and long-run. Economic growth explains most of its variations but as time progressed the variation decreased and FCF, FDI and INT variation kept on increasing. FCF explained much of the variation compared to all other exogenous variables in the study. Using the variance decomposition analysis, it can be seen that FCF explains much of the variations in economic growth in South Africa.

5.1. Chapter Summary

This chapter consisted of six sections. Unit root test was conducted in the first section in which Augmented Dickey-Fuller test was used as the main test and Philips-Peron tests as a confirmatory test were used to test for stationarity. Both of them revealed that the data series under consideration contain a unit root in levels and become stationary after first differencing. This implies that the series is integrated at the same order which is the order I (1). Cointegration tests were conducted soon after unit root tests. Johansen Maximum Likelihood Approaches were used to test for cointegration. Pairwise correlation matrix and the lag order selection criteria were also presented in this chapter. Results from Pairwise correlation, a maximum of 5 lags were used to permit adjustments in the model and realize well-performing residuals. The results show that both the Trace and Maximum Eigenvalue tests rejected at most, not in favor of at least one cointegration vector and the results were significant at 5 percent level. These results prove that there is a long-run relationship in the variables since the variables are tied together in a single way, in the long-run, therefore, there is one long-run equilibrium relationship.

The VECM model was presented in the third section since the variables can have either short-run or long-run effects. Results show that all the variables had a statistically significant effect on economic growth in South Africa except FCF. The results exhibited that RER_EXCHANGE and M3 have a negative long-run effect on economic growth, and on the other hand FDI and INT have a positive long-run effect on economic growth.

In the last section, diagnostic tests were carried out in the study. All three diagnostic tests supported the statistical fitness of the equation. Diagnostic checks were done on the growth model in order to authenticate the parameter evaluation of the outcomes achieved by the model and to determine whether there was any problem in the residuals from the assessed model. In conclusion, both impulse response analysis and variance decomposition were found to be compatible with economic theory and this permits reliable results and policy recommendations to be derived from this study. The next is chapter six in which conclusion, policy recommendations, and limitations are done in the light of the estimation, presentation, and analysis of the results in Chapter 5.

CHAPTER SIX

6. Summary, Conclusion, Policy Recommendations, and Limitations

6.1. Summary of the Study and Conclusions

The main objective of the study was to assess the role of real exchange rate on economic growth in South Africa during the period of 1994 - 2015. To achieve this, different chapters were formulated. The first chapter presented the introduction and background of the study. The chapter also discussed the problem statement, research questions, objectives, hypotheses, and organization of the study. Chapter two conducted a trend analysis between exchange rates and economic growth. The chapter also analyzed various phases of the different programs and exchange rate system adopted since 1994 in South Africa. A literature review was presented in chapter three and theoretical and empirical expositions were presented in this chapter. Chapter four presented the methodology of the study which formulated the growth model. Chapter five presented the estimation, analysis, and interpretation of the results. This final chapter, Chapter six, presents the conclusions, policy recommendations and limitations of the study.

Both theoretical and empirical literature revealed that real exchange rate is a significant variable for improving economic growth in South Africa. Many developing nations use exchange rates as a standardized price between the foreign markets and domestic markets (Gibley, 2016). Different transmission channels were discussed in chapter three which include exchange rate devaluation and evaluation channels. In addition, different theories were also reviewed such as the Solow-Swan Growth model and the Keynesian theory. These theories have different background and expectations. The general idea about these theories was that policy makers can use real exchange rates as a tool to attain high levels of economic growth in both developing and developed economies. The Solow-Swan Growth Model suggested that exchange rates affect economic growth via technology, capital movements, and imported technology have expansionary effects on economic growth. Empirical literature revealed that real exchange rates can affect economic growth positively or negatively depending on elasticities of demand and supply in developing and developed countries.

The study made use of econometrics analysis and various tests such as Descriptive statistics ADF and PP tests, ECM, VECM, Impulse Response Function and Variance Decomposition were applied. Subsequently, Johansen's Cointegration and Error Correction Mechanism (ECM) were used to determine both the long and short-run relationships among the variables. The use of time series data requires checking if the individual time series data is either stationary and is integrated at the same order. To achieve this, graphical representation method was used first as a preliminary test for a unit root. However, the graphical method had limitations and this paved way for a formal unit root test which was performed using the Augmented Dickey-Fuller and Phillips-Perron tests as a confirmatory test. All unit root tests indicated that all the time series had a unit root in levels and then became stationary after first differencing. The Impulse Response Function was used to check the responsiveness of the dependent variable in the VAR to external shocks and each other. Variance Decomposition analysis was carried out to check for the variables that explain most of the variations in the dependent variable. The results showed that growth explains much of its variations followed by real exchange rates.

In addition, the real exchange rate as an explanatory variable included in the study was aggregate money supply (M3), Gross Fixed Capital Formation (FCF), Foreign Direct Investment (FDI) and Interest Rate (INT). These variables were included in the growth model as suggested in the theoretical-empirical literature. Theoretical and empirical exposition assisted in the specification of the growth model used in the study.

6.2. Policy Implications and Recommendations

This section presents policy implications and recommendations according to the findings of the study. From empirical results of the study, several policy recommendations were derived. Thus far, the section is divided into exchange rate policy, fiscal policy, and monetary policy.

6.2.1. Exchange Rate Policies

Exchange rates as a medium of exchange in international trade have been regarded as an important instrument for boosting trade. Theories in chapter three suggested various ways in which exchange rate devaluation or evaluation can be used to improve economic growth taking elasticities of demand and supply into consideration. For instance, if demand or supply is perfectly inelastic, either devaluation or evaluation can be beneficial to the economy in the short-run and long-run. First and foremost, due to the direct causal flow from exchange rate to exports in developing economies, the Monetary Authorities should consider the short-run effects of real exchange rates on South African exports. Presently, the Rand is weak compared to its trading partners' currencies (SARB, 2016). As such, literature revealed that indeed exchange rate devaluation in the short-run and long-run is good for exports and economic growth. The results of the study also revealed a negative relationship between the RER and the economic growth both in the short and long-run. Therefore, the study recommends that in the short-run, the Reserve

Bank of South Africa should use expansionary monetary policy on overall supply of the currency to weaken the Rand against other currencies. Exchange rate devaluation exerts expansionary effects on economic growth both in the short-run and long-run. As such, if money supply exceeds its demand, the price is forced to go down, hence Rand depreciation follows. Weak currency as suggested by literature is a good instrument for boosting exports. Nonetheless, a contractionary monetary policy should be used in the long-run if inflation sets in. A strong currency is a good instrument for inflation and correcting of the balance of payment disequilibrium.

Nonetheless, the empirical results from other authors reviewed in the study suggest that a monetary policy geared towards appreciating the Rand will be detrimental to South African exports in the short-run, as it will decrease exports. In the long-run, the SARB is recommended to implement policies which strengthen the Rand (contractionary monetary policy as a revaluing method). A weak currency as suggested by literature and confirmed by results in the study is a good instrument to boost exports and increase production and economic growth. Thus, exchange rate devaluation policies are favorable in South Africa to increase economic growth. Devaluation has two highly desirable features as an expenditure-switching policy. According to Sibanda (2012), depreciation must offset the difference between domestic and world inflation to entice investments and exports by reducing wages and prices.

6.2.2. Monetary Policy

Money supply and interest rates are two major instruments which are used by most central banks in the monetary policy framework. Monetary policy is regarded as the process by which the monetary authorities in a country manipulate or control the supply of money to lower inflation rate ensuring price stability and general trust in the currency. Empirical findings of the study revealed that money supply (M3) and interest rate (INT) have a negative effect on economic growth in South Africa in the short-run and long-run. The short-run results are found to be statistically insignificant since the t-statistic value is less than two. Nevertheless, in the long-run, the effect is statistically significant as the t-statistic value is greater than two. Contractionary monetary policy, in the long-run, is advisable as the Rand becomes stronger which can be a good instrument for controlling inflation, foreign debt payments and balance of payments disequilibrium. Interest rates were also found to have a negative effect on economic growth in South Africa in the long-run. This suggests that decreasing the repo rate which in turn decreases the prime rate can induce investments thereby improving economic growth in the long-run.

In addition, making use of impulse response analysis and variance decomposition analysis, it was noted that real exchange rates explain much of the variations in economic growth. Real exchange rates, therefore, are a vital tool in inducing economic growth in South Africa. After the adaptation of inflation targeting in 2000, interest rates have been a major priority for the central bank to keep inflation within the threshold and to induce growth via foreign investments. In recent years, interests have been an important instrument for inflation and have contributed to a stable growth and inflation was kept within its threshold. Therefore, the study recommends the maintenance of the current monetary policy of inflation targeting using interests as a nominal anchor. The South African economy is heavily dependent on foreign investments because domestic savings are low. Given the long-run relationship and the variance decomposition analysis, this study recommends that the current monetary and exchange rate policy should be maintained in South Africa.

6.2.3. Fiscal Policy

Fiscal policy is one major instrument used by the government to collect revenue via taxes and to invest into the economy via fixed capital formation. Savings in South Africa have been regarded as very low. Therefore, South Africa needs to promote domestic savings while creating further opportunities for foreign investment. Savings create more capital; hence, sound fiscal policies will continue to be pursued aimed at sustaining a moderate and affordable public sector borrowing requirement and encouraging broad-based economic growth. Higher taxes discourage savings and in South Africa, taxes are a major source of revenue for the government. Therefore, in order to increase savings, the study proposes a proper taxation system which induces more savings. Results show a positive relationship between fixed capital formation and economic growth in the long-run. Thus, the study recommends proper policies that enhance savings such as higher interest rates bearing savings and tax reductions. Infrastructure development attracts foreign investments, as such, the study recommends that the government should maintain public investment policies in place. South Africa's investment sovereign credit rating was acknowledged by Moody's Investment Services (MIS) in October 2016. This replicates an acknowledgment that South Africa's combination of sound economic and financial policies is a strong base for long-term growth and development. Amongst emerging markets in Africa, South Africa has the best infrastructure.

6.3. Limitations of the study and areas for further research

The first major limitation was the unavailability of quarterly data on some variables suggested by the theoretical and empirical literature regarding the role of real exchange rates and economic growth. Secondly, some of the secondary data used in this study were obtained from diversified sources which are also subject to error, hence the absolute reliability of the data is not guaranteed. With regards to the exchange rate, not only does misalignment (overvaluation or undervaluation) affect the economy but also the volatility thereof and the political framework of the economy influences the currency market. The Rand has been volatile since the adoption of the free-floating system and for the past three years, fluctuations in the exchange rate levels have been affected by different forces such as consumer expectations. Thus, the study recommends for further research assessment of other macroeconomics variables such as inflation and trade openness on economic growth in South Africa.

6.4. Summary

The main purpose of this study was to assess the role of real exchange rates on economic growth in South Africa for the period between 1994: Q1 and 2015: Q4. The hypothesis was that real exchange rates are not statistically significant in affecting economic growth in South Africa. Given the regression results, the null hypothesis was rejected. Thus, the results revealed that real exchange rate statistically plays a role in economic growth both in the short-run and long-run. The regression results revealed that real exchange rate affects growth negatively in the short-run, and in the long-run, the situation changes as results showed a positive role that real exchange rate plays on economic growth in South Africa. Therefore, the alternative hypothesis which stated that real exchange rates have a statistical effect on economic growth was not rejected. This shows that real exchange rate plays an important role in economic growth in South Africa. As such, findings of the study can be used by policy governing boards and other future researchers.

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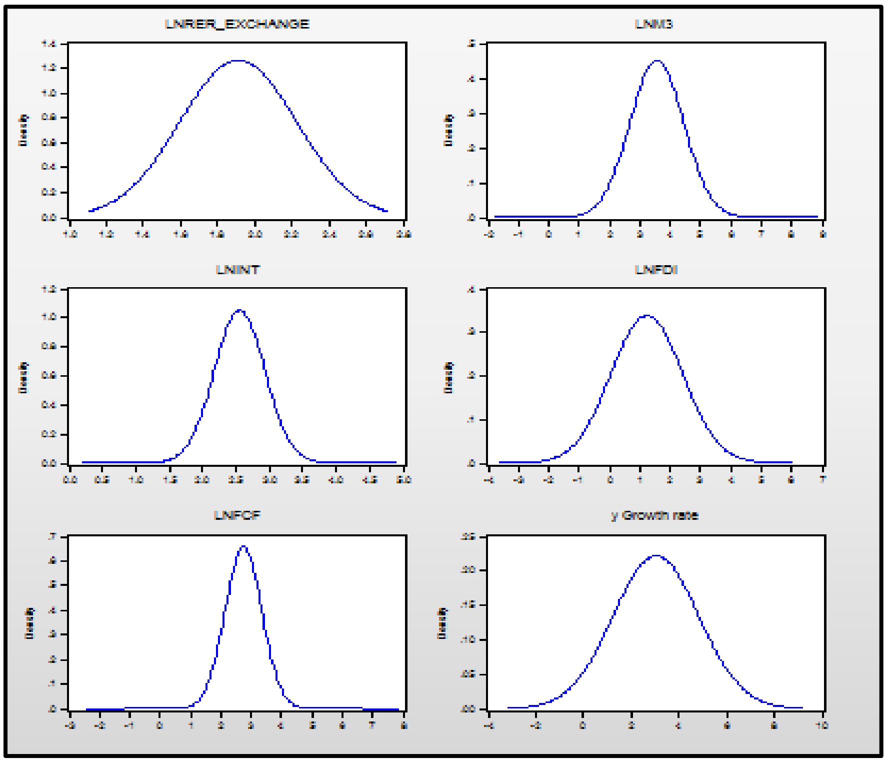
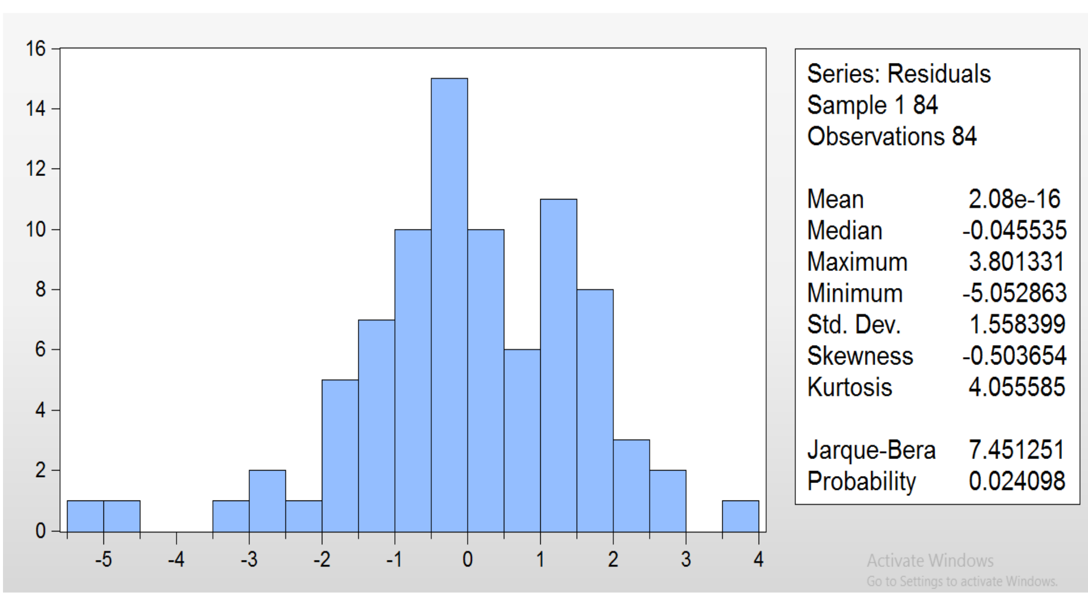
APPENDICES

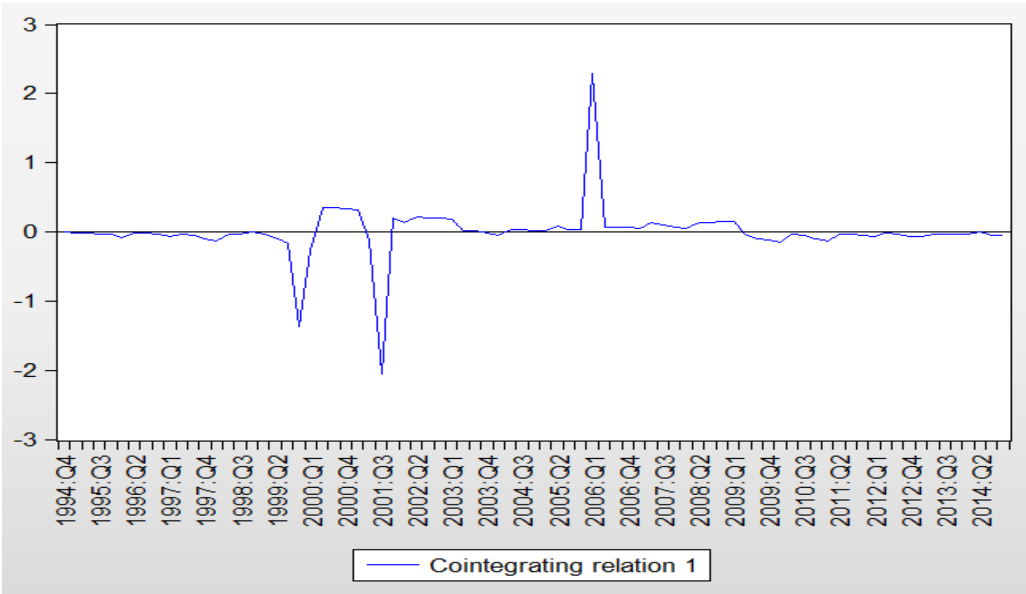
APPENDIX 1: GRAPHICAL OBSERVATION OF J-B TEST STATISTIC RESULTS



APPENDIX 1 (b): Histogram



APPENDIX 2: COINTEGRATION VECTOR



APPENDIX 3: COINTEGRATION RESULTS

Date: 05/19/17 Time: 07:21
Sample (adjusted): 1994Q3 2015Q4
Included observations: 80 after adjustments
Trend assumption: Linear deterministic trend
Series: LNY_GROWTH_RATE LNFCF LNFDI LNINT LNM3 LNRER_EXCHANGE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.435542	109.1645	95.75366	0.0043
At most 1	0.263990	63.41334	69.81889	0.1458
At most 2	0.240019	38.89243	47.85613	0.2646
At most 3	0.142013	16.93546	29.79707	0.6448
At most 4	0.055481	4.682105	15.49471	0.8416
At most 5	0.001445	0.115706	3.841466	0.7337

Trace test indicates 1 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 *	0.435542	45.75115	40.07757	0.0104
At most 1	0.263990	24.52091	33.87687	0.4181
At most 2	0.240019	21.95697	27.58434	0.2226
At most 3	0.142013	12.25335	21.13162	0.5229
At most 4	0.055481	4.566399	14.26460	0.7953
At most 5	0.001445	0.115706	3.841466	0.7337

Max-eigenvalue test indicates 1 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):

LNY_GROW...	LNFCF	LNFDI	LNINT	LNM3	LNRER_EXCHANGE
-0.499120	5.678939	-0.032405	-1.577624	-3.066866	2.319694
-0.887787	1.550924	-0.746074	-4.317914	-1.045606	0.434887
0.435836	2.290087	-3.625008	-2.467105	2.663935	5.578474
1.150467	3.341310	-1.115344	-1.564256	-1.934594	4.830319
-0.301809	0.213277	-0.576781	1.865276	-0.482788	3.551074
-0.204074	-1.167860	0.977804	0.622708	-0.190390	0.998532

Unrestricted Adjustment Coefficients (alpha):

D(LNY_GRO...	0.046626	0.076320	-0.005889	-0.091658	0.070068	-0.005345
D(LNFCF)	-0.180108	-0.038682	-0.048889	0.018694	0.042347	0.000563
D(LNFDI)	-0.184340	0.004037	-0.001821	0.029871	0.061331	0.006167
D(LNINT)	-0.044789	0.106759	0.026400	0.049643	-0.021575	-0.004634
D(LNM3)	-0.081166	-0.003817	-0.144808	0.077792	0.063877	0.002279
D(LNRER_E...	-0.012125	0.016132	-0.015126	-0.007650	-0.006362	0.001089

1 Cointegrating Equation(s): Log likelihood 24.02342

Normalized cointegrating coefficients (standard error in parentheses)

LNY_GROW...	LNFCF	LNFDI	LNINT	LNM3	LNRER_EXCHANGE
1.000000	-11.37790	0.064924	3.160810	6.144545	-4.647566
	(1.94268)	(1.02042)	(1.54691)	(1.22233)	(2.14489)

Adjustment coefficients (standard error in parentheses)

D(LNY_GRO...	-0.023272
	(0.02580)
D(LNFCF)	0.089895
	(0.01791)
D(LNFDI)	0.092008
	(0.02236)
D(LNINT)	0.022355
	(0.01758)
D(LNM3)	0.040511
	(0.02732)
D(LNRER_E...	0.006052
	(0.00376)

2 Cointegrating Equation(s):	Log likelihood	36.28388			
Normalized cointegrating coefficients (standard error in parentheses)					
LNY_GROW...	LNFCF	LNFDI	LNINT	LNM3	LNRER_EXCHANGE
1.000000	0.000000	0.981034	5.172568	0.276844	0.264311
		(0.87022)	(1.16031)	(0.96796)	(1.50196)
0.000000	1.000000	0.080517	0.176813	-0.515710	0.431703
		(0.11819)	(0.15759)	(0.13146)	(0.20399)

Adjustment coefficients (standard error in parentheses)

D(LNY_GRO...	-0.091028	0.383153
	(0.05185)	(0.29971)
D(LNFCF)	0.124236	-1.082814
	(0.03624)	(0.20949)
D(LNFDI)	0.088424	-1.040593
	(0.04563)	(0.26372)
D(LNINT)	-0.072424	-0.088780
	(0.03350)	(0.19362)
D(LNM3)	0.043900	-0.466856
	(0.05574)	(0.32221)
D(LNRER_E...	-0.008270	-0.043840
	(0.00743)	(0.04294)

3 Cointegrating Equation(s):	Log likelihood	47.26236			
Normalized cointegrating coefficients (standard error in parentheses)					
LNY_GROW...	LNFCF	LNFDI	LNINT	LNM3	LNRER_EXCHANGE
1.000000	0.000000	0.000000	3.985591	1.139174	1.300376
			(0.86970)	(0.38911)	(0.99073)
0.000000	1.000000	0.000000	0.079394	-0.444936	0.516736
			(0.12531)	(0.05606)	(0.14275)
0.000000	0.000000	1.000000	1.209925	-0.879001	-1.056095
			(0.25063)	(0.11213)	(0.28551)

Adjustment coefficients (standard error in parentheses)

D(LNY GRO...	-0.093594	0.369667	-0.037104
	(0.05639)	(0.32156)	(0.18841)
D(LNFCF)	0.102929	-1.194775	0.211920
	(0.03890)	(0.22181)	(0.12997)
D(LNFDI)	0.087630	-1.044763	0.009562
	(0.04963)	(0.28297)	(0.16580)
D(LNINT)	-0.060918	-0.028322	-0.173899
	(0.03627)	(0.20682)	(0.12118)
D(LNM3)	-0.019212	-0.798477	0.530406
	(0.05761)	(0.32850)	(0.19248)
D(LNRER_E...	-0.014862	-0.078480	0.043188
	(0.00784)	(0.04468)	(0.02618)

4 Cointegrating Equation(s):	Log likelihood	53.38904			
Normalized cointegrating coefficients (standard error in parentheses)					
LNY GROW...	LNFCF	LNFDI	LNINT	LNM3	LNRER EXCHANGE
1.000000	0.000000	0.000000	0.000000	-1.015884	1.638553
				(0.39880)	(0.90923)
0.000000	1.000000	0.000000	0.000000	-0.487865	0.523473
				(0.04955)	(0.11296)
0.000000	0.000000	1.000000	0.000000	-1.533222	-0.953433
				(0.18197)	(0.41488)
0.000000	0.000000	0.000000	1.000000	0.540712	-0.084850
				(0.14293)	(0.32588)

Adjustment coefficients (standard error in parentheses)

D(LNY_GRO...	-0.199043	0.063411	0.065125	-0.245197
	(0.07945)	(0.35549)	(0.19230)	(0.27096)
D(LNFCF)	0.124436	-1.132312	0.191070	0.542539
	(0.05597)	(0.25044)	(0.13547)	(0.19089)
D(LNFDI)	0.121996	-0.944954	-0.023754	0.231155
	(0.07133)	(0.31913)	(0.17263)	(0.24325)
D(LNINT)	-0.003805	0.137550	-0.229268	-0.533102
	(0.05145)	(0.23021)	(0.12453)	(0.17547)
D(LNM3)	0.070285	-0.538549	0.443641	0.380099
	(0.08176)	(0.36580)	(0.19788)	(0.27882)
D(LNRER_E...	-0.023664	-0.104041	0.051721	-0.001244
	(0.01120)	(0.05013)	(0.02712)	(0.03821)

5 Cointegrating Equation(s):	Log likelihood	55.67224			
Normalized cointegrating coefficients (standard error in parentheses)					
LNY_GROW...	LNFCF	LNFDI	LNINT	LNM3	LNRER_EXCHANGE
1.000000	0.000000	0.000000	0.000000	0.000000	0.242811
					(0.76026)
0.000000	1.000000	0.000000	0.000000	0.000000	-0.146814
					(0.35220)
0.000000	0.000000	1.000000	0.000000	0.000000	-3.059955
					(0.92751)
0.000000	0.000000	0.000000	1.000000	0.000000	0.658045
					(0.33105)
0.000000	0.000000	0.000000	0.000000	1.000000	-1.373919
					(0.66881)

Adjustment coefficients (standard error in parentheses)					
D(LNY_GRO...	-0.220191	0.078355	0.024711	-0.114500	-0.094992
	(0.07974)	(0.35071)	(0.19173)	(0.28243)	(0.22784)
D(LNFCF)	0.111655	-1.123280	0.166644	0.621529	0.405964
	(0.05638)	(0.24800)	(0.13558)	(0.19971)	(0.16111)
D(LNFDI)	0.103486	-0.931874	-0.059129	0.345555	0.468875
	(0.07163)	(0.31507)	(0.17224)	(0.25373)	(0.20468)
D(LNINT)	0.002706	0.132949	-0.216824	-0.573345	0.010439
	(0.05220)	(0.22959)	(0.12551)	(0.18489)	(0.14916)
D(LNM3)	0.051007	-0.524926	0.406798	0.499247	-0.314178
	(0.08230)	(0.36199)	(0.19789)	(0.29151)	(0.23517)
D(LNRER_E...	-0.021744	-0.105398	0.055390	-0.013110	-0.002104
	(0.01134)	(0.04987)	(0.02726)	(0.04016)	(0.03240)

APPENDIX 4: ERROR CORRECTION RESULTS

Dependent Variable: Y_GROWTH_RATE
Method: Least Squares
Date: 09/07/16 Time: 11:58
Sample (adjusted): 2 88
Included observations: 87 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.24822	2.002338	7.115788	0.0000
LNRER_EXCHANGE	-4.017225	0.762599	-5.267809	0.0000
LNM3	-0.405327	0.397235	-1.020370	0.3106
LNFCF	-0.888499	0.472679	-1.879711	0.0638
LNFDI	1.046545	0.322106	3.249066	0.0017
LNINT	-0.387820	0.405870	-0.955529	0.3422
RESID01(-1)	0.794793	0.071508	11.11469	0.0000

R-squared	0.687375	Mean dependent var	2.977011
Adjusted R-squared	0.663929	S.D. dependent var	1.807587
S.E. of regression	1.047889	Akaike info criterion	3.008470
Sum squared resid	87.84566	Schwarz criterion	3.206876
Log likelihood	-123.8684	Hannan-Quinn criter.	3.088362
F-statistic	29.31632	Durbin-Watson stat	1.688149
Prob(F-statistic)	0.000000		

APPENDIX 5: VECTOR ERROR CORRECTION MECHANISM

Vector Error Correction Estimates
Date: 05/19/17 Time: 07:13
Sample (adjusted): 1994Q3 2015Q4
Included observations: 80 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNY_GROWTH_RATE(-1)	1.000000
LNFCF(-1)	-11.37790
	(1.94268)
	[-5.85682]
LNFDI(-1)	0.064924
	(1.02042)
	[0.06363]
LNINT(-1)	3.160810
	(1.54691)
	[2.04331]
LNM3(-1)	6.144545
	(1.22233)
	[5.02691]
LNRER_EXCHANGE(-1)	-4.647566
	(2.14489)
	[-2.16681]
C	9.098092

Error Correction:	D(LNY_GR...	D(LNFCF)	D(LNFDI)	D(LNINT)	D(LNM3)	D(LNRER_...
CointEq1	-0.023272	0.089895	0.092008	0.022355	0.040511	0.006052
	(0.02580)	(0.01791)	(0.02236)	(0.01758)	(0.02732)	(0.00376)
	[-0.90187]	[5.02031]	[4.11465]	[1.27193]	[1.48288]	[1.60857]
D(LNY_GROWTH_RAT...	0.213392	-0.311317	-0.288691	-0.067785	-0.298050	-0.044957
	(0.12050)	(0.08362)	(0.10442)	(0.08208)	(0.12758)	(0.01757)
	[1.77090]	[-3.72308]	[-2.76470]	[-0.82589]	[-2.33627]	[-2.55884]
D(LNFCF(-1))	0.082554	0.155356	0.336242	-0.061569	0.374282	-0.007391
	(0.29163)	(0.20237)	(0.25271)	(0.19863)	(0.30875)	(0.04252)
	[0.28308]	[0.76769]	[1.33052]	[-0.30996]	[1.21224]	[-0.17383]
D(LNFDI(-1))	-0.106068	0.106154	0.064389	0.032186	0.149085	0.033333
	(0.24054)	(0.16692)	(0.20844)	(0.16384)	(0.25466)	(0.03507)
	[-0.44097]	[0.63597]	[0.30891]	[0.19645]	[0.58542]	[0.95043]
D(LNINT(-1))	-0.030476	1.376799	1.418161	-0.722821	1.616131	0.002262
	(0.20679)	(0.14350)	(0.17919)	(0.14085)	(0.21893)	(0.03015)
	[-0.14738]	[9.59470]	[7.91412]	[-5.13194]	[7.38197]	[0.07503]
D(LNM3(-1))	0.074209	-0.280713	-0.351243	-0.055426	-0.627917	0.006775
	(0.16310)	(0.11318)	(0.14133)	(0.11109)	(0.17267)	(0.02378)
	[0.45500]	[-2.48027]	[-2.48519]	[-0.49893]	[-3.63642]	[0.28489]
D(LNRER_EXCHANGE(...	0.080337	0.177569	0.346174	0.233476	0.290630	0.071800
	(0.77924)	(0.54074)	(0.67526)	(0.53076)	(0.82500)	(0.11362)
	[0.10310]	[0.32838]	[0.51265]	[0.43989]	[0.35228]	[0.63194]
C	-0.035568	-0.000460	0.044869	-0.005654	0.017955	0.017680
	(0.05434)	(0.03771)	(0.04709)	(0.03701)	(0.05753)	(0.00792)
	[-0.65460]	[-0.01219]	[0.95292]	[-0.15278]	[0.31212]	[2.23163]

R-squared	0.092711	0.860756	0.794589	0.310347	0.730328	0.203771
Adj. R-squared	0.004502	0.847219	0.774618	0.243298	0.704110	0.126360
Sum sq. resids	15.39539	7.413555	11.56099	7.142453	17.25670	0.327295
S.E. equation	0.462412	0.320883	0.400711	0.314961	0.489567	0.067422
F-statistic	1.051042	63.58265	39.78808	4.628624	27.85590	2.632318
Log likelihood	-47.59675	-18.36642	-36.13948	-16.87627	-52.16203	106.4417
Akaike AIC	1.389919	0.659160	1.103487	0.621907	1.504051	-2.461043
Schwarz SC	1.628122	0.897363	1.341690	0.860109	1.742253	-2.222840
Mean dependent	-0.038628	0.004042	0.049558	-0.000523	0.020425	0.020974
S.D. dependent	0.463457	0.820941	0.844057	0.362072	0.900011	0.072134

Determinant resid covariance (dof adj.)	4.16E-08
Determinant resid covariance	2.21E-08
Log likelihood	24.02342
Akaike information criterion	0.749414
Schwarz criterion	2.357282

APPENDIX 6: DATA BANK

YEAR	y Growth rate	RER exchange	INT	FCF	FDI	M3
1994: Q1	2	3.4535	15.25	12.88328059	0.693232571	13.80678961
1994: Q2	3.9	3.6253	15.25	13.02372478	0.685792871	13.69269286
1194: Q3	3.9	3.5564	16.25	13.23338284	0.678165132	13.99353061
1994: Q4	3.3	3.5601	16.25	13.50723981	0.667031508	14.47606602
1995: Q1	4	3.5992	17.5	13.76855132	0.664630829	14.81305559
1995: Q2	1.6	3.6619	17.5	14.24633202	0.661692698	15.46831668
1995: Q3	3.6	3.662	18.5	14.25414811	0.658848719	15.77875333
1995: Q4	3.2	3.665	18.5	14.25767225	0.656258695	16.40098398
1996: Q1	3.2	3.9282	18.5	14.57621678	0.790994513	17.22015189
1996: Q2	4	4.3502	20.5	14.76178187	0.776451442	17.65893396
1996: Q3	5.6	4.4968	19.5	14.86259145	0.7677391	17.88458006
1996: Q4	3.8	4.6816	20.25	14.87046996	0.760526096	18.27740563
1997: Q1	3.9	4.4361	20.25	15.14703944	0.854864427	19.32462401
1997: Q2	3.2	4.4981	20.25	15.19204668	0.84966704	19.53247482
1997: Q3	2.3	4.6901	20.25	15.22569069	0.847895714	20.69253934
1997: Q4	1.8	4.8707	19.25	15.2937353	0.84661749	21.17259253
1998: Q1	1	4.9711	18.25	15.61319471	1.104668575	22.00527077
1998: Q2	0.6	5.3609	22.25	15.57976403	1.103108806	22.70470295
1998: Q3	0.3	6.1215	25.5	16.00678715	1.105531589	23.30689884
1998: Q4	0.1	5.8857	23	16.23191678	1.104464327	23.96987567
1999: Q1	0.1	6.209	20	14.94794436	1.243022859	23.84923106
1999: Q2	1.1	6.0883	18	14.23937323	1.233208261	24.18905833
1999: Q3	2.8	6.0593	16.5	1.4014104	0.121988605	2.465076784
1999: Q4	3.7	6.146	15.5	14.07529079	1.206616877	25.46585904
2000: Q1	3.6	6.4597	14.5	14.11679931	4.137275582	24.97814637
2000: Q2	3.4	6.9274	14.5	14.18852197	4.099555192	24.94205362
2000: Q3	5.2	7.1614	14.5	14.30551476	4.05935257	25.55289909
2000: Q4	4.5	7.6392	14.5	14.48776645	4.025108602	26.27878584
2001: Q1	4.5	7.8833	1.5	14.4327493	4.124502302	27.21193674
2001: Q2	3.7	8.055	13.75	0.14324883	0.041039863	0.277077203
2001: Q3	1.4	8.6272	13	14.28539437	4.093115007	28.748099
2001: Q4	2	11.5467	13	14.12681575	4.061884853	29.94070883
2002: Q1	3.5	11.4938	15	14.14924352	5.021455754	31.75315109
2002: Q2	3.8	10.1392	16	14.09064482	4.961375929	32.05304144
2002: Q3	3.6	10.6044	17	14.28168056	4.921010613	32.70322102
2002: Q4	3.9	8.9597	17	14.54342068	4.888353332	33.97248949
2003: Q1	3.2	8.0439	17	14.64910016	3.644405696	34.71341099
2003: Q2	3.2	7.9027	17	15.08690964	3.626694719	35.95645533

2003: Q3	3	7.3246	13.5	15.47445507	3.607120782	36.50029229
2003: Q4	2.4	6.5159	11.5	15.88951383	3.586432088	37.3936218
2004: Q1	3.7	6.6328	11.5	16.12272957	4.319312776	38.47789697
2004: Q2	3.7	6.4351	11.5	16.21497197	4.259786269	38.43491631
2004: Q3	5	6.5469	11	16.61660754	4.191253882	39.68407456
2004: Q4	5.7	5.7323	11	17.00008009	4.146969473	40.01004902
2005: Q1	5.4	6.0103	11	17.01945686	4.895952347	41.05996935
2005: Q2	5.2	6.75	10.5	17.16828804	4.809640392	42.60085773
2005: Q3	5.5	6.3578	10.5	17.445998	4.744936565	43.14239093
2005: Q4	5	6.3591	10.5	17.89998632	4.713376646	4.593706933
2006: Q1	5.1	6.2544	10.5	17.99486873	6.271645889	49.43176019
2006: Q2	4.8	6.9549	11	18.26246868	6.183816991	49.89192466
2006: Q3	5.3	7.4098	11.5	18.63152674	6.099573747	51.18774249
2006: Q4	7.1	7.0406	12.5	18.94821862	6.016381072	53.05791416
2007: Q1	6.4	7.3514	12.5	19.73648316	7.20683839	56.00458297
2007: Q2	5.5	7.1718	13	19.96449859	7.148257744	58.4665308
2007: Q3	5	7.1282	13.5	19.95978855	7.065455518	60.85635218
2007: Q4	4.7	6.8271	14.5	20.08031678	6.966747387	62.37642206
2008: Q1	3.8	7.9799	14.5	20.84899026	8.362362589	64.95361776
2008: Q2	4.7	7.9188	15.5	21.24846914	8.261500598	67.20000265
2008: Q3	3.2	8.0472	15.5	22.21013995	8.241804636	68.55529425
2008: Q4	1.1	9.9456	15	22.87353096	8.288996127	70.70628155
2009: Q1	-1.1	9.9932	13	21.61145056	7.294805011	72.31927167
2009: Q2	-2.6	8.0518	11	20.86825979	7.319925137	72.86005093
2009: Q3	-1.9	7.5235	10.5	20.23134518	7.302989194	72.25081882
2009: Q4	-0.5	7.4894	10.5	19.93281739	7.254617685	72.70644982
2010: Q1	2.4	7.4258	10	19.58508638	9.437227873	72.18624074
2010: Q2	3.1	7.6473	10	19.40153425	9.379766598	72.68260226
2010: Q3	3.3	7.1389	9.5	19.12743118	9.275785779	73.95435444
2010: Q4	3.4	6.8294	9	18.96021177	9.174897195	74.69663704
2011: Q1	3.2	6.9086	9	19.4242052	10.57388777	74.08124368
2011: Q2	3.3	6.7875	9	19.5771175	10.51819091	74.30156033
2011: Q3	3	7.5214	9	19.76927809	10.49072271	76.79839702
2011: Q4	3.3	8.1745	9	20.16279906	10.41006387	78.90066229
2012: Q1	2.2	7.5998	9	19.9115263	11.29858916	77.4616997
2012: Q2	2.8	8.3962	9	19.79390258	11.1964464	77.65275559
2012: Q3	2.1	8.2784	8.5	20.05571567	11.16308703	80.64093664
2012: Q4	1.8	8.6385	8.5	20.24522837	11.11374066	81.28747463
2013: Q1	1.3	9.1747	8.5	20.62669941	11.86129082	82.06214429
2013: Q2	2.2	10.0307	8.5	20.92531062	11.75419625	83.10697063
2013: Q3	1.8	9.983	8.5	21.35020127	11.71915047	84.59061551

2013: Q4	2.9	10.3675	8.5	21.33380631	11.57471017	83.67935888
2014: Q1	1.9	10.7468	9	20.90827504	13.34154557	86.63976289
2014: Q2	1.3	10.6758	9	20.59396809	13.32380965	88.61144866
2014: Q3	1.6	10.953	9.25	20.60927441	13.25361676	89.771596
2014: Q4	1.4	11.4613	9.25	20.53071413	13.11923444	88.57617179
2015: Q1	2.2	12.0644	9.25	16.259237	42.5992444	71.2206349
2015: Q2	1.3	12.306	9.25	16.0967954	43.0467913	71.869861
2015: Q3	1	13.6073	9.5	15.8544949	42.5992444	72.280999
2015: Q4	0.5	14.926	9.75	15.2639481	40.896999	72.1269084