

THE IMPACT OF EXCHANGE RATE VOLATILITY ON FOREIGN DIRECT
INVESTMENT AND DOMESTIC INVESTMENT IN SOUTH AFRICA

BY

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DECLARATION

I, Aidoo Lesley, declare that this study titled “*THE IMPACT OF EXCHANGE RATE VOLATILITY ON FOREIGN DIRECT INVESTMENT AND DOMESTIC INVESTMENT IN SOUTH AFRICA*” is my original work. As a matter of fact, this dissertation has never been submitted for any degree at any other university or otherwise. All materials used in the study have been indicated and acknowledged through various references.

Signed

Date

DEDICATION

This work is dedicated to Wilhelmina ‘Baby Yaa’ Otari.

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LIST OF ACRONYMS AND ABBREVIATIONS

ARCH:	Auto Regressive Conditional Heteroscedasticity
AsgiSA:	Accelerated and shared Growth Initiative
CPI:	Consumer Price Index
DI:	Domestic Investment
DTI:	Department of Trade and Industry
FDI:	Foreign direct investment
GARCH:	General Autoregressive Conditional Heteroscedasticity
GATT:	General Agreement on Tariffs and Trade
GDP:	Gross domestic product
GEAR:	Growth Employment and Redistribution
GMM:	Geneal Method Movement
MPK:	Marginal Product Capital
OECD:	Organisation for Economic Co-operation and Development
RDP:	Reconstruction and development Programme
RER:	Real effective exchange rate
SA:	South Africa
SARB:	South African Reserve Bank
STASA:	Stsastistics South Africa
UN:	United Nations
UNCTAD:	United Nations Conference on Trade and Development
US:	United States
USD:	United States Dollars
VAR:	Vector Auto regression

VECM: Vector Error Correction

ZAR: South African Rands

ABSTRACT

Foreign currency is a crucial part of globalization, thus after the adoption of the free floating system, the country experienced volatility in their currency. As a country known for its openness, foreign trade is an important part of the economy. However volatility of the country's currency affects different aspect of the Macroeconomic environment which includes investments. The primary focus of this study is to examine empirically the impact of exchange rate volatility on foreign direct investment and domestic investment in South African for the period 1980 – 2015. The GARCH was used to measure volatility of exchange rate after which the study applied the Vector Error Correction Model method and Granger causality test to achieve the primary objective. The short-run analysis indicated a relationship between the exchange rate volatility, FDI and DI in South Africa. The long run showed FDI had a positive and statistically significant relationship with inflation rate, interest rate and export while a negative relationship with exchange rate volatility, GDP and Corporate tax was observed. From the DI model, the long run result indicates that there is a positive relationship between DI and exchange rate volatility, GDP and political stability while DI was observe to have a negative relationship with interest rate, inflation and export. This implies that 1 percent increase in variables with positive relationship with the dependant variables FDI and DI will increase the inflow of FDI as well as increase the rate of domestic investment. However, a 1 percent increase in variables with negative relationship will result in fall in FDI and DI in South Africa. Hence based on the long run results, the study, recommends policy implementation to increase inflation rate, interest rate and export in order to increase inflow of FDI while exchange rate volatility, GDP and Corporate tax should be monitored. The study also recommends that exchange rate volatility, GDP and political should be encouraged in order to increase the rate of DI in the country whereas, interest rate, inflation and export should be monitored so as not to decrease domestic investment.

Key Words: Exchange rate, domestic investment, foreign direct investment, Vector Error Correction Model, Variance Decomposition, Impulse Response, South Africa

CHAPTER 1

INTRODUCTION

1.1 Background

Foreign currency is crucial part of globalization, thus making exchange rate a largely influential variable in the economy. Volatile exchange rate has been considered to impact many factor in an economy, which is why countries come up with policies to maintain the exchange rates stable.

Principally volatile exchange rate is seen as a matter of importance especially in countries that introduced flexible exchange rate regime into their country because of its high changeability (Arize et al, 2005). According to Melku (2012), the fall of Bretton woods structure resulted in volatile exchange rates in developing and developed countries. The reality of the collapse was countries currency were not supported by a commodity such as gold or silver, but rather their value which was entirely up to the confidence on its value. (García-Herrero et al, 2008). According to Melku (2012), meddling with exchange rates in the factor market and the fragile macroeconomic structure is the causes of volatility experienced in the exchange rate.

The exchange rate system in South Africa is a free float system, the float system are determined by the market mechanism which are the supply and demand factors (Chiloane 2003 cited Van der Merwe). According Sibanda (2012), misalignment is an issue most countries with free floating regime face; misalignment can be defined as when the exchange rate, actual or monitored real exchange rate shifts from equilibrium. Misalignment has the power to render a currency either under valuated or over valuated (Montiel and Serven cited by Sibanda, 2012).

The South African Rand has gone through some fluctuations, which has led to Ngandu (2006) examining the exchange rate fluctuations history in South Africa. The study revealed that the rands underwent a short appreciation in the early 80s; however, by 1985 there was a severe depreciation that halted in the last quarter of the same year. There was also a sign of real depreciation of exchange rate which was seen as not being severe until 2001 when it accelerated, and went on to a significant low in December 2001. In the following four years after that incidence, it started growing strongly by 75 percent. The year 2005 presented a fluctuation, then a slight decline of 2 percentages in the nominal exchange rate over the years. The year 2005 saw the rand depreciating by 9 percent during the first half of the year, but by

the second half of year it began regaining its strength by 2.1 percent from December 2005 to 28 February 2006. These are sort of movement observed throughout the years shown by the South African rand.

In trying to understand the causes of this exchange rate fluctuation, Twarowska and Kąkol (2014) made it clear that there are no general agreements in literature on factors affecting exchange rate fluctuations. However, they categorised factors that may have the likelihood to influence the volatility of exchange rate as economic factors and non-economic factors.

Although a single determinant cannot be associated to the volatility of the exchange rate, its effects are suggested to be linked into different areas in the macro economic environment. Numerous researchers have studied the effect of investment on exchange rate volatility. Among these are e Goldberg (1993), who examined the exchange rate uncertainty on the U.S. industry-level investment; Darby, Hallett, Ireland & Piscitelli, (2000), their study was based on the exchange rate uncertainty on aggregate investment in five Organisation for Economic Co-operation and Development (OECD) economies; and Pindyck and Solimano (1993), Serven and Solimano (1993) as well as Serven (2002) who considered exchange rate uncertainty on some developing economies. They all have complied studies about exchange rate volatility on investment. The one thing that theses researches had in common with their findings is the importance of investment in the exchange rates of different countries, and how it serves as a driving tool for growth.

Due to the importance of investment, developing countries started working on the increment of investment in their countries through domestic investment and international support. However, there was still a huge gap between the investment required in the country and the availability of resources; hence the solution was to the need for foreign investment to bridge that gap (UNCTAD, 2013). With Africa as one of the fastest growing continent, attracting investment was not difficult. However, Ogunleye (2009) suggested that exchange rate volatility is a disincentive to investors as they see it as a risk when it comes to investing in place of choice. Darby *et al.* (1999) state that exchange rate volatility makes investment decision very simple. It is either there is investment or not.

South Africa as one of the largest nations in Africa that has proved to be a very attractive destination for foreign investors; it is known to be one of the top for foreign direct investment (FDI) inflows in the continent. In 1970 the country had a total of 333.6 dollars of FDI inflow, which was the highest in comparison to other Sub Saharan African countries even at that time

(Ogunleye, 2009). Table 1 below looks into the FDI inflow into South Africa over the years. From the table it shows the FDI inflow to South Africa was generally high in all the aspects. Although the FDI inflow is a % of Gross Domestic production (GDP), it shows the inflow was low throughout and consecutively remained less than 1 percent except for 2001 where it was 5.73 percent and in 2005 was 2.67. Ogunleye (2009) said South Africa showed more than 1 percent for FDI Inflow as % of GDP for 1997, 1999, 2001 and 2007 because the primary objective was privatisation transaction.

Figure 1.1 FDI to South Africa, 1970 – 2005

Table 1: FDI to South Africa, 1970 - 2005

Table 2: Performance of FDI in South Africa, 1970-2005 Year	FDI Inflows (Million \$)	FDI Outflows (Million \$)	FDI Stock (Million \$)	FDI Inflow Per Capita (\$)	FDI Stock Per Capita (\$)	FDI Inflow as % of GDP	FDI Stock as % of GDP	FDI Stock as % of GFKF
1970-79	92.22	70.68	N/A	4.23	N/A	0.49	N/A	N/A
1980-89	14.16	221.08	11 576	0.61	363.82	0.00	14.82	63.51
1990-99	850.31	1 295.84	16 579	19.80	395.69	0.59	12.33	76.87
2000-05	2 724.27	-220.52	48 296	58.13	999.64	1.76	28.51	182.02
2000	887.90	270.80	43 462	19.56	956.91	0.67	32.69	215.89
2001	6 788.70	-3 180.1	30 568	147.53	666.20	5.73	25.88	171.91
2002	756.70	-398.90	29 611	16.24	634.36	0.68	26.65	177.38
2003	733.70	565.10	45 714	15.58	968.22	0.44	27.44	173.40
2004	799.20	1 352.10	63 064	16.81	1 325.02	0.37	29.34	182.08
2005	6379.40	67.90	77 361	133.07	1 447.10	2.67	29.05	171.44
1970-2005	719.79	404.25	21 974	16.53	522.80	0.60	17.02	95.99

Source: UNCTAD Foreign Direct Investment Data base (cited Ogunleye, 2009)

OECD (cited by Ogunleye, 2009) reported that South Africa has put policies in place for attracting foreign investment, which was not the case before 1994. It however has worked on these policies over the years thus making it gain the reputation of being the most open country. Reports show that large amounts of projects into Africa from foreign countries flow mostly into South Africa. Gelb (2005) indicates that about \$20 total investment was from China to Africa, from 1998 to 2002 investments increase to \$120 million of which 20% of that amount was sent into South Africa. In agreement with those stats was Rob Davies, the

South African Minister of Trade and Industries who stated that 24% of the overall FDI inflows from China were sent to South Africa.

The flow of investment both foreign and domestic, impacts a country positively, and exchange rate plays an important role in it. According to (Maepa, 2015), a country's attractiveness in terms of global standard exchange rate is measured by examining its investment status. He also asserted that local investors accumulate their countries currency as it serves as an asset, indicating a relationship between these two variables.

Various studies have been extensively made on FDI and their relationships with exchange rate volatility, nevertheless, this literature in South Africa are sporadic. Within the same context is the rarity of literature done on the volatility of exchange rate on domestic investment. Thus, the objective of this research is to have a better understanding of the effect of exchange rate volatility on foreign direct investment and domestic investment. The purpose is to investigate the implication of foreign exchange rate's volatility on Foreign Direct Investment (FDI) and Domestic Investment (DI). This study addresses the extent to which the variable exchange rate will affect FDI and DI in South Africa. However, since studies on the subject exchange rate volatility effect on both FDI and DI in South Africa have not been tackled, this study is closing that gap and therefore making a contribution to this field.

1.2 Problem statement

According to Hamdu (2013), exchange rate volatility is a huge area of interest in research for the international finance since the collapse of Bretton Wood era; this may be attributed to its unpredictable nature. Consequently, it is no different in South Africa, as stated by Otuori (2013) that volatile exchange rate is an important research area in the country. As the years progress the interest has not diminished, rather it is expanding into different areas. With the unpredictable nature of exchange rates, a lot of studies have been conducted on it along with other variables FDI included. Although, surprisingly, there have been studies on the exchange rate volatility effect on DI in South Africa, much has not been done in the area, hence this research studies exchange rate volatility's influence on the level of FDI and DI in South Africa.

The South African rand (ZAR) has shown volatility over the years, this has been a nerve cracking issue for any of its government. The exchange rate of the rand against the dollar was 8 in June 2001, by December it had increased to 12 (Raddatz, 2008). By June of 2002,

the rand had spiralled down, depreciating by 50 percent against the dollar. In 2003 the rand took a drastic appreciation of 7.56 against the USD, which it maintained for some time. Then in 2014 the rand was faced with a rocky depreciation against the United States Dollar (USD) at 10.15 which continued to slide into 2015 (SARB, 2015). This movement is a general occurrence made evident after the breakdown of the Bretton wood practice in South Africa.

Due to raised concerns of the rand volatility, President Thabo Mbeki formed the Myburgh Commission, with the sole mission being to investigate the cause of the rand depreciation in 2001. On a recent report by the Economist Intelligence Unit, the rand is said to be one of the extreme volatile currencies of the developing market, and it is disposed to critical movements (Economist Intelligence Unit, 2007). Concern was raised by the South African investment climate that the country's exchange rate serves as a constriction to some South African companies' growth and technique (Raddatz, 2008).

South African rand volatility has affected almost every aspect of the South African economy which includes FDI and DI. However, understanding the relationship between exchange rate volatility and investments is important in a dynamic economy. Therefore, since investments play an important role in the economic growth and vice versa, Fedderke and Romm, (2006) stated that economic growth is also one of the conditions for higher FDI inflow. It is therefore important that investments maintain a stable flow into the country and curb factors that may cause disruptions to the investment flow.

This study seeks to investigate the relation between the effects the exchange rate has on investment in general. The focus is on assessing the consequences on FDI and DI; however, from existing literature it is evident that limited empirical research has been done detailing the relationship that exchange rate has on domestic investment. The empirical research in this study is to prove that the neglect of DI and over focusing of FDI leads to an imbalance, considering that the connection between the exchange rate and DI is an important agenda on micro economic policy implementation. Thus this study seeks to investigate the effects of exchange rate volatility on FDI and DI.

1.3 Objectives of the Study

Main Objective

The main objective of this study is to inspect the impact of exchange rate volatility on FDI/DI for South Africa.

To reach this main objective, the following sub-objectives were set as being to:

1.3.1 Critically screening of literature related to exchange rate, investment and exchange rate volatility in South Africa.

1.3.2 Measure the exchange rate volatility using the GARCH and the ARCH and in the process identify the factors that contribute to volatility in the exchange rate.

1.3.3 The Vector Error Correction Model (VECM) would be used to establish if there is a long-run and short- run relationship between Exchange rate volatility and FDI/DI.

1.3.3 Formulate policy commendations based on the results of the study.

1.4 Hypothesis of the Study

H0 – There is no significant relationship between exchange rate Volatility and FDI or DI inflows into South Africa

H1- There is a significant relationship between exchange rate Volatility and FDI or DI inflows into South Africa.

1.5 Significance of the Study

This study will help to fill the gap in the existing literature in a number of ways. Firstly, number of researchers have pointed the importance of understanding exchange rate and exchange rate volatility (Bajpai, and Mohanty, 2008, Hodge, 2005) however, a many of these studies have a mainly focused on exchange rate volatility effect on FDI (Crowley and Lee, 2003, Ogunleye, 2009, Ellahi, 2011). In reality exchange rate and exchange rate volatility effects are considered on all investment not only FDI but DI as well. All things considered, FDI and DI are both important contributors of growth in an economy.

Furthermore, there is a need to study the exchange rate volatility determinants in South Africa, because after the 2007/2008 credit crisis that caused some financial services to fail, the South African rand weakened by 48% against the US dollar (USD). That event is therefore a worrying concern for every successive government in South Africa, hence the need for this research.

This research determines the levels of volatilities of the South African Rand and the effect it has on FDI and DI. The findings of the study will be used in constructing a model that will assist both Foreign and Domestic investors with a clear understanding of their investments in relation to the volatility of the exchange rate.

1.6 Organisation/Outline of the Study

This study is organised into six chapters. As stated above, Chapter 1 is the introductory chapter. It consists of description of the aims and objectives, problem statement, research questions and hypothesis, and significance of the study. Chapter 2 is the literature review which provides both theoretical and empirical literature associated to this study. It also reviews critical assessment of the previous research and how it relates to this study. Chapter 3 is an overview of South Africa's macroeconomic environment. Chapter 4 presents an explanation of the appraisal techniques implemented in this study. Discussion of the source and definition of the variables used are explained in detail and the estimation results of the different tests conducted are presented followed by their interpretation. In Chapter 5 the estimation model is presented and the results are presented. Chapter 6 presents the dissertation's key findings, policy recommendations, suggestions for further research and conclusion.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The chapter's objective is to articulate conceptual foundations of the study and provide an assessment of the theories pertaining to the possible causes of exchange rate volatility, measures of exchange rate volatility, and the relationship between exchange rate volatility and investments.

2.2 Exchange Rate Regimes

Interconnections of countries leave them vulnerable to external shock attacks. The exchange rate regime is a tool used to soften the blows of external shock and is thus deemed to be quite an important tool (Khosa, 2012). Melku (2012) also observed that exchange rate volatility in the financial market is sustained by the country's exchange rate regime. Therefore, the study of the type of regime used in a country is important because of the close relationship shared between the regime and the exchange rate movement.

The consideration of the suitable exchange rate regime for a country is a very critical one, because the balance of all microeconomic policies relies on that decision. There are many types of exchange rate regimes that are observed in different studies (Frankel, 1999).

2.2.1 Fixed Exchange rate

This type of rate is rigid, thus the domestic currency can only be exchanged with a specific foreign currency at a fixed date through the support of the monetary organisation built on jurisdictive commitment (Yagci, 2001). This type of system prevents countries from following an autonomous monetary policy and exposes inflationary inclination into the country. Therefore, in order to combat inflation in a country, the financial institution would peg the country's currency with a hard currency that has anti-inflation status. This system would work in favour of that country. The idea of that strategy according to reliable peg workers and managers is that wages and prices are set on the foundation that the future would hold a low inflation environment. Edwards and Magendzo (cited by McDonald, 2007) argue that the stronger the peg, the more effective it has in the enhancement of reliability.

According to Stone *et al.* (2008), fixed exchange rate system works well in with countries with good fiscal and organisational policies and minimal inflation. This regime can endure at a point for a lengthy period, during which it provides a higher degree of confidence for pricing international transaction. The financial institution in the country with this system does not depend on the monetary policy since it has no exchange rate to regulate and its interest rates are pinned to those of the anchor currency country.

Fixed rates regimes are considered to be beneficial due to their anti-volatile nature compared to the flexible regime. This makes trade and investments decisions certain as there are no undesirable impact on international trade and investment, therefore foreign trade and investment are encouraged (McDonald, 2007).

The fixed exchange rate can be considered to have maximum credibility for the economic policy regime it provides; it is also not prone to currency crisis (Yagci, 2001). Khosa (2012) also mentioned that the regime makes certain the currency remains constant. This assures supporters of this regime of certainty in a business environment, hence this reduces concerns of exchange rate risk; therefore, the less concern the parties are, the more likely they engage in trade.

An interesting finding, which is however a challenge of the fixed exchange rate regime, was when Carrera and Vuletin (2002) mentioned that the fixed exchange rate regime causes more volatility than the floating regime. This is because the degree of commitment to the regime linearly affects the exchange rate stability, hence when government maintains its commitment to the fixed exchange rate, the volatility is lower than floating, but if the central reserve banks do not maintain commitment to the fixed regime, the volatility is higher.

Harrigan (2006) mentioned that sustaining the peg causes alteration of the financial market since the adaptation of this regime causes the monetary institution to partly sacrifice key variables such as the money supply. Therefore, when authorities are managing domestic inflation, they reduce the domestic money supply; this measure reduces the money circulation.

Another challenge that was observed about the fixed regime is that it has to maintain the peg, and in order to maintain the peg, large amounts of foreign exchange reserves are needed (Obstfeld and Rogoff, 1995). However, in order to ensure that, the currency has to be fixed at a level against another currency, hence if in case the currency weakens and drops below the

set level, the central bank immediately interferes by selling its foreign exchange, thus growing the need for its own currency and therefore helping to recover it. The reverse happens, if the currency appreciates over the fixed level, the country's financial institutions intervene by amassing the supply of currency. All these can be done only if the country has a strong exchange rate reserve, because if there is a continuity of appreciation more intervention would be needed.

2.2.2 *Floating Exchange Rate Regime*

The floating regime is primarily market regulated. Economies with floating exchange rates permit their financial institutions to intervene with the exception of a few countries such as the United States and Iceland, to mention a few. The intervention mostly utilised by the reserved bank allows the purchasing and selling of foreign currency in exchange for domestic currency, in order to constraint short-term exchange rate volatility (Stone *et al.*, 2008).

Floating exchange rate lets an economy to pursue its own monetary policy. The rate of change of official reserves should be zero under a floating rate system. However a conflicted response may be experienced when an economy is faced with a decline, whereby aggregate demand is so high due to the central bank stimulating the economy with money supply resulting in the exchange rate depreciation and causing a shift to the economy to an internal or external balance (Stone *et al.*, 2008).

However, the floating regime, in comparism with the fixed rate, is considered the best and had pioneers such as Friedman championing it simply because the fixed regime does not have the adjustment instrument in play, thus leaving the fixed regime helpless to speculative attacks and periodic catastrophe. The restful state of exchange rate in a floating regime is as a result of its stabilised nature of expectation.

Under the floating regime, the central bank benefits from two possibly significant things which are the profit gained from printing money and 'lender of last resort'. The 'lender of last resort' comes in handy during banking emergencies whereby the institution can print unrestricted money into the system to help out the banks. The floating regime lets the exchange rate to equilibrate the balance of payment in a country, thus giving the world economy a chance to operate without the alternative of protectionist devices or if there is it is limited.

Theoretically, the floating exchange rate system has the authorised reserve of zero, which is explained by the fact that their returns compared to a long term investment are very minimal. However, they have a limited amount of saving in a case where payment of official business transaction should arise (McDonald, 2007). The floating exchange rate regime seems suitable for most countries especially when the demise of the fixed exchange rate regime. However it has its flaws, the one which is mentioned by Gandolfo (1995) is the risk introduced by the unpredictable nature of the exchange rate. When the economy is in favourable times, the exchange rate rises for an extended period (Khosa, 2012) and in unfavourable times it falls, which is not good for the economy.

2.2.3 The other types of Exchange regimes

Inspecting the exchange rate regimes supposedly, an economy is categorized amongst two extremities of the regime it is either fixed or flexible regime as explained in previous sections. One greatly fluctuates and the other is difficult to be altered as it is fixed. However other types of exchange rate systems are in between these two systems as described by Melku (2012). These include:

- **Fixed but adjustable exchange rates**

This regime is similar to the fixed exchange rate. Nevertheless, this target is likewise movable in light of the imbalance of the BoP (balance of payment). Depreciation and reappraisal of the exchange rate during phases of imbalance from the equilibrium ends in the exchange rate pursued.

- **Fixed but flexible within a band**

Fixed but flexible within a band, permits exchange rates to be flexible. This means that fluctuation is allowed to take place in a monitored environment so that it does not shift beyond the permitted band. Should the want for currency increase, the exchange rate is permitted to increase as well, but when the demand for the currency decreases, the rate is permitted to drop again within its band. In case the exchange rate shoots outside its band, there would be interference by the county's financial institution to restore it inside the cut-off points.

- **Flexible exchange rates with market intervention**

The flexible rate with market intervention is a regime commonly used. It incorporates floating but managed regime, floating independent regime and target zones. The degree of variance and recurrence of mediation is noted as the distinct feature of this regime. Compared to the managed floating, this regime is quite adaptable in autonomous floating. That is the reason intervention is targeted at the decreasing fluctuations and the unpredictability of the exchange rate of the two regimes.

- **Managed floating regime**

According to Gandolfo (1995), the managed floating regime is a combination of fixed and floating regimes that regulate its fluctuations. The management of the regime is the monetary institutions job. The foreign exchange market is continually monitored without pre-focusing on a pre-declared way for the exchange rate, which may be direct or indirect affected by changes in interest rates, among others. The domestic economy is driven freely by the monetary policy. Although according to Yagci (2001) this system is flawed, because its transparency is questionable. This is because the rules for the intercession are not unveiled and they are not quickly identifiable, prompting vulnerability and absence of validity.

- **Dual exchange rate system**

The dual regime utilises two different regimes simultaneously. Commercial transactions of importation and exportation are utilised with fixed exchange rate, while for trade in financial assets work with flexible exchange rate. When the commercial transactions need to be protected from volatility and speculation, a country adopts this regime.

2.3 Determinants of the Choice of Exchange Rate Regimes

When a country decides on an exchange rate regime, there are many things considered before the decision is made, Frankel (1999) stated that the decision of picking a regime best suited for a country is important because a regime is determined by the type of country and the era. Countries with large and medium industries adapt the floating exchange rate regime. It is also adopted by countries with emerging markets with small import and export markets compared

to their GDP but have different production and trade, incorporated in the global capital market, strong financial sector and good standards.

For countries that have stable currencies, the fixed exchange rate regimes are suitable for them. These include countries in the European Economic and Monetary Union), neighbouring small countries joined with bigger the bigger ones (dollarization in Panama), monetary disorder history, extreme cases of inflation and countries that don't have credible policy makers that would sustain the monetary stabilization (currency board in Argentina and Bulgaria).

The soft peg regimes (crawling narrow band, crawling peg, pegged within bands, crawling broad bands and fixed peg) can be used in countries that have partial relations to the international capital market, and have not much variety of productions and exports and superficial financial markets. They can also be used by countries that have prolonged inflation that is stabilizing under an alleviated exchange rate programme (Turkey).

The intermediate regimes is a mixed regime where floating with its benefits, however to avoid its inadequacies the fixed peg is integrated. They are mostly used in countries with developing market economies and developing countries with organised macroeconomic policies and somewhat solid financial sector.

2.4 South African Exchange Rate Regime Evolution

This section sourced historical information from Van der Merwe (1996), Chiloane (2013) and Mtonga (2011). They provide a compilation of the history of the South African Exchange regime from 1945 till present.

Van der Merwe (1996) divided South Africa's exchange regime system into 5 periods. He summarised it as:

- From 1945 to 1971, this was the Bretton wood period characterised by the arrangement of fixed but flexible exchange rates.
- 1971 to 1979, this period was categorised by the breakdown of the Bretton wood structure where the country's government worked to preserve a relative steady exchange rate of the rand.
- 1979 to 1985, this was the reformation era where the exchange rates were meant for evolving the market for foreign exchange and a floating exchange rate system.
- 1985 to 1994, an era with lots of socio-political events which forced the government to return to more direct control measures in order to control the rand.

- 1994 to 1995, during these years the government of national unity began with the country's global finance dealings, controls and measures initiated in the development of an accelerative market, where there would not be an intervention of the reserve bank and the exchange control gradually eased up.

Table 2.1 depicts the exchange rate regime from the 1960s till present and its stages and the changes it has undergone.

Figure 2.1 Exchange rate regimes from the 1960s till present

Episode	Date	Exchange rate regime
I	Feb 1961 – July 1971	Fixed exchange rate regime: rand pegged to the British pound
II	Aug 1971 – Nov 1971	Fixed exchange rate regime: rand pegged to the US dollar
III	Dec 1971 – Sept 1972	Fixed exchange rate regime: rand pegged to the British pound
IV	Oct 1972 – May 1974)	Fixed exchange rate regime: rand pegged to the US dollar
V	June 1974 – May 1975	Crawling peg rand: rand pegged to a basket of currencies
VI	June 1975 – May 1979	Fixed exchange rate regime: rand pegged to the US dollar
VII	June 1979 – Jan 1983	Dual exchange rate regime: Crawling peg commercial rand and free floating financial rand
VIII	Feb 1983 – Aug 1985	Unitary exchange rate: Managed float rand
IX	Sept 1985-Feb 1995	Dual exchange rate regime: managed float commercial and free float financial rand
X	Mar 1995 – Jan 2000	Unitary exchange rate : Managed float rand
XI	Feb 2000- present	Unitary exchange rate: free floating rand, with inflation-targeting framework of monetary policy

Source: Mtonga (2011).

December 1945, an important period because that was when South Africa and other countries agreed on maintaining the exchange rate within 1 percent, a signatory Bretton Wood monetary agreement. However it was agreed that in case of disequilibrium in balance of payment, the said economy could adjust the exchange rate by more than the fixed rate through the knowledge of the International Monetary Fund (IMF). In December 18 of 1946 the value of the South African pound was 4.03 against the United States Dollar which was then equivalent to 3.58134 grams of fine gold. However due to no foreign exchange market competitiveness, the rand was pegged to the pound sterling. In 1949, after the devaluation of the pound sterling, the South African pound was reduced by 30.5 percent to 2.00 of the United States dollar (Van de Merwe, 1996). In 1961 the Rands took over the pound as South

Africa's official currency where at that time the gold parity was fixed at 50 percent of the value of the South Africa pound.

Fast forward to early 1970 the Bretton wood system was breaking down, as president Nixon of the United States made an announcement that the dollar won't be converted to Gold, thus causing floating exchange rate regime system to be generalised, which saw the rand being pegged to the dollar.

In 1972 the pound sterling declined against major currencies which was authorised by the British administration, hence to maintain the balance of payment the rand was pegged to the sterling again, that lasted only four months and was pegged back to the United States dollar till 1974.

Then in 1974 the country pursued independent managed floating regime; the regime was a success till March of 1975. Within that period Aaron *et al.* (cited by Chiloane, 2013) indicated that 11 adjustments were made. Van de Merwe (1996) mentioned that on the 22 of September 1975 there was a devaluation of the rand by 17.9 percent to 1.5 dollar per rand, though the rand link with the dollar maintained its effectiveness till 1979.

In 1979 an interim report was published and it was identified that the exchange rate arrangement had some problems, dual exchange rate as a solution was introduction; the dual exchange rate regime included the commercial and financial rand rates. Mtonga (2011) explained that the commercial rand was the principal rate and it was applied to all transactions by residents. It was a floating rate, but subjected to an official intervention policy by the South African Reserve Bank. On the other side was the financial rand, which was a secondary rate that was applied only to capital transactions of non-residents. Another explanation given was that the financial rand was created to encourage investment and discourage disinvestment and the commercial rand was used for international trade and not connected to foreign investment issues (Smith, Mosert and Oosthuizen, 1996).

February 1983 saw an introduction of flexibility in the domestic foreign exchange rate market; this was done with the guidance of De Koch Commission (1985). The newly introduced regime saw the discontinuation of the financial rand and the reinstating of the managed floating exchange rate regime. There were some changes that occurred due to the change in the regime. On the 7th of February the minister removed the control over the non-residents, making visitor equity capital easily transferrable from common Monetary Area at

the unitary exchange rate of the rand (Van der Merwe, 1996). He also mentioned that they inserted the forward market; which was monitored by the reserve bank thus the action expanded the domestic foreign exchange market.

In the late 1984, due to the international campaigns against apartheid, financial sanctions were imposed on the reserve bank which was forced to return back into the foreign exchange rate market. However its influence of the capital flow on monetary reserves was regulated under conditions of direct control. There were large scales of credit withdrawals; the American banks did not forgive South Africa's ripening debt and the lending rights were revoked, causing South Africa to not meet international commitment by declaring moratorium on its repayments. This in turn prompted more serious sanctions on the country, the debt stood still on certain forms of foreign loans. In order for the problem to be fixed there was the introduction of dual rate regime (Ayogu and Dezhbakhsh, 2008; Van der Merwe, 1996; Mtonga, 2011).

In 1994 there was a successful political transition from apartheid to an all-inclusive democracy which in turn saw to the ending of the country's economic isolation although the country continued to use the dual rate regime till March 1995 when it was changed back to a single managed floating system. The financial rand was done away with, there was a statement released by Chris Liebenberg the minister of finance, stating that there will not be a financial rand any more. Further he mentioned that South Africa would have one unitary exchange rate which is applicable to the current and capital transaction between residents and non-residents, and it is the commercial rand. This new regime was part of a bigger plan to put the country back into the global economy, thus easing the financial market. The new regime was to be determined by the market forces although with occasional intervention of the reserve bank because the aim was to keep the rand stabilized. Therefore in terms of fluctuations, the reserve bank would intervene to smooth it out; like in 1996 and 1998 the reserve bank intervened to prevent the increasing depreciation of the rand (Mtonga, 2011; Chiloane, 2013).

The year 2000 saw the adaptation of inflation target as the operating frame work of the monetary policy. This frame work was that the monetary policy will be focused on announcing that during a certain period the inflation standard would have to be met with a forecast of a clear inflation as intermediate variable and interest rate as policy instrument. However, it was only after February 2004 that one saw the implementation success. This

regime however had similarities to the free float regime, therefore due to the speculation of whether the regime was appropriate for the country due to the globalization and increased macroeconomic volatility. Because of that, the monetary policy regime was then changed to inflation targeting (Mtonga, 2011).

Presently, South Africa is operating under a free floating exchange rate system, whereby exchange rate is determined by demand and supply. The Reserve Bank does not directly use foreign exchange reserves or monetary policy tools to intervene in the foreign exchange market. Therefore, the Rand is allowed to freely float against all the major currencies. Thus as the rand is allowed to float, it displays high short-term exchange rate volatility and medium term swings that are only weakly related to economic fundamentals.

2.5 Types of Exchange Rate

Currencies are used by countries for the estimation of the prices of goods and service; for example, the dollar for USA, France uses the euro, UK is the pound sterling, Japan's currency is yen, and the Rands in South Africa. It is vital at this section, to differentiate the types of exchange rate, because they are decided based on the exchange regime the country uses.

Ohazulike (2012) explained that interchange rate is the value of two currencies relative to each other. Alternatively it is the value of a host currency stated for a different country's. When a country's currency depreciates, it either has an encouraging or a destructive effect on investment, thus to further explain that statement we look at the country's currency depreciation in that it would reduce inflows of foreign investment, due to the ideal that lower level of exchange rate is linked to lower expectations of future profitability. To measure exchange rates there are different forms that are utilised for this, thus this section is looks into the various exchange rates. These include real exchange rate, nominal exchange rate (bilateral exchange rate) and multilateral (effective) exchange rates. The focus of the study is on the multilateral effective nominal interchange rate.

2.5.1 Real Exchange Rate

What interest consumers is the various goods and services bought with their domestic currency if expressed in terms of currency from of other countries (Zhang, 2009). Nominal interchange rate is the quoted interchange rate in money terms at a particular period; while a real exchange rate is measured by inflation differentiation (Colander and Gamber 2002). Fosu (1992) states that it is when relative prices of domestic country and a foreign country's

nominal rates are adjusted so there is an established attractions to produce, buy and store goods and services. In terms of South Africa and the United States real exchange rate; the South African rand and the United States dollar's nominal exchange rate is adjusted to their country's ratio.

Abela and Bernanke (2005) provided a formula for the real interchange rate among two currencies (South African currency against the United States currency with the former being domestic currency and the latter being regarded as a foreign currency) and as given

$$RER = e \frac{p^*}{pd}$$

Where

e is the nominal interchange rate of South African Currency against the United States currency;

p* is the average foreign price of goods in the us economy;

pd is the average price of goods in south Africa; and

a currency analysed in real exchange rate is considered significant due to the inclusion of inflation (Mohr, 2005).

Exchange rate considers the purchasing power of a currency; however, the concept that does not recognise the purchasing power of currency is the nominal exchange rate (Chiloane, 2013).

2.5.2 *Nominal exchange rate*

The Nominal interchange rate is the measurement of comparative prices of two moneys or currencies (Danmola, 2013). Abel and Bernanke (2005) define it as the number of the domestic currency that can buy foreign currency. Nominal exchange rate can be measured in the indirect citation and direct citation. Indirect citation is the cost of other country's money as units of local money, while direct quotation is the cost price of the domestic money in regards to foreign money (Takaendesa, 2006). In an instance to acquire one US dollar (US\$), it would mean paying 14.98 Rand (ZAR).

Thus

Direct quotation: 1 US\$ = ZAR14.98

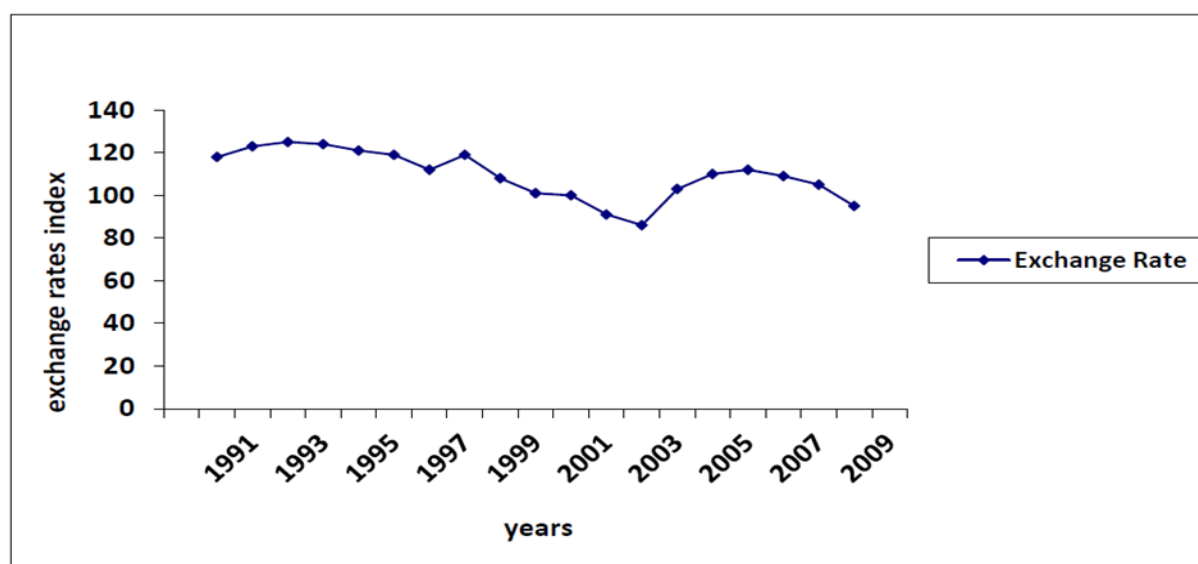
Indirect Quotation: ZAR1 = US\$ 0.066 (calculated as 1/14.98)

South Africa mostly uses the direct quotation, which is the value of Rands in terms of other countries' currencies. Therefore if the acquiring of other currencies with the rand increases, it is said that the rand has depreciated and vice versa. Thus if 1US\$ = ZAR15 it means the rand

has depreciated against the dollar, alternatively if 1US\$ = ZAR 14 it is said the rand has appreciated.

The graph below shows years South African Rand appreciated and depreciated.

Figure 2.2 Movements of South African Rands



Source: South African Reserve Bank (cited by Siyabulela, 2011)

In 1998 there was an increase of the South African interchange rate, after a significant depreciation in 2002. However, after that there was a continuous appreciation of the rand reaching 110 in 2004 to 112 in 2005, then between the years 2006 and 2008 the exchange rate declined from 106.00 to 95. This is a sort of trend witnessed of the South African exchange rate along the years. However calculating effective exchange rate measures the movement of the rand against other main trading currencies.

2.5.3 Multilateral Effective Exchange Rate

Effective exchange rate is the weighted average rate which is derived by weighting the exchange rates between a country's currency and other main currencies (Mohr 2005). In a country that trades with a number of other countries, it is deemed important that the domestic currency is weighted against other currencies (Chiloane, 2013). This type of exchange rate is referred as the trade weighted exchange rate. Basically the total value of the Rand compared to other currencies in South Africa's foreign trade e.g. the United States Dollar. Zhang (2009) wrote that the weights are attached to the price indices to be able to estimate the range of the effective exchange rate.

The multilateral exchange rate was developed by Hirsch and Higgins in 1970 because the bilateral exchange rate exhibited some challenges. These are the calculation of the domestic

currency against a single currency to estimate if the domestic currency has appreciated or depreciated because if the domestic currency may have depreciated against the said currency is being put against however when compared to other currency it may have appreciated (Chiloane, 2013).

It is the reserve bank's duty to regularly calculate approximately the effective rate of which results are sent to the SARB Quarterly Bulletin and printed. To attain the effective exchange rate, the nominal rates are used and the adjustment of nominal effective foreign price ratio is used in the measurement of effective exchange rate. Bilateral exchange rate are two different types, similarly are the multilateral interchange rate namely the nominal effective interchange rate and the real effective interchange rate.

2.6 Exchange Rate Volatility

Exchange rate volatility is the fluctuations of the exchange rate within a short range for a long period (Frenkel and Goldstein, 1987). In a clearer definition, it is a risk associated with unexpected movements in the exchange rate (Ozturk, 2006). However it can be simply put as the changes in the price of a currency becoming unpredictable. Therefore the more interchange rates fluctuate over time, the more volatile they become.

Interchange rate volatility can be attributed to different sources in the economy; however, the monetarist and the Keynesian theorist attributed exchange rate volatility to activities in the financial sector, especially with countries operating under flexible exchange rate regimes and the contents in the balance of payment. Twarowska and Kakol (2014) said net export causes a demand for currency while, the net FDI causes a supply of the currency, hence this makes a determinate of exchange rate volatility the BoP respectively. The monetarists mentioned that one factor that causes volatility is the buying power of parity (PPP), among various monetarist forms that that gets its fundamental authority from the regulation of the single price (Twarowska and kakol, 2014). Khosa (2012) also explained it as the difference in prices between countries by comparing the value of basket of goods in the country.

Exchange rate volatility causes a lot of problems. Udoh and Egwaikhide (2008) wrote that volatile exchange rates have some disadvantages; firstly low price elasticity causes the effect of exchange rate depreciation to be on the contrary. The second disadvantage is usually

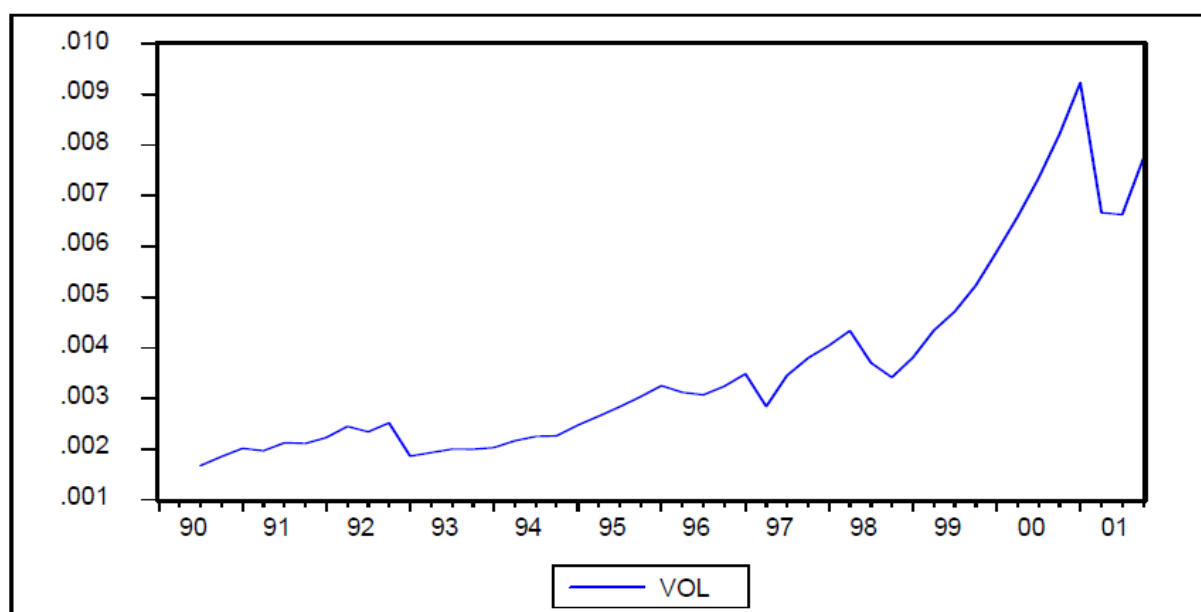
associated with exchange rate uncertainty and exchange rate risks. Third, exchange rate volatility causes a huge reduction in the value of the asset in the host country, and also causes profit that would have been generated by that asset to reduce. Lastly, the exchange rate movements' speculation for the future would be unbalanced, which in turn would cause losses in economic efficiencies. Thus with that established, exchange rates are always monitored.

However in South Africa, the exchange rate remains one of the key macroeconomic instruments, thus South African reserve bank aims at providing a stable exchange rate. FIGURE 2.2, below indicates exchange rate volatility in South Africa (Van der Merwe, 1996).

Figure 2.2 illustrates the exchange rate of the South African Rands against the U.S. dollar. It shows a rising volatility since 1990.

Wolf (2002) at the TIP annual conference said the rand was exceedingly poor in 2001 amongst other African countries with a deterioration level against the United States currency by 45 %. To support that fact, Bah and Amusa (2003) explained that the unpredictability of the rand against the U.S dollar was due to external investors' having negative sentiments towards South Africa, which caused the encouragement of short-term speculation on the Rand.

Figure 2.3 Exchange rate Volatility in South Africa



Source: Bah and Amusa (2003)

2.6.1 Determinants of Exchange Rates Fluctuations

There are various factors that contribute to the fluctuations of exchange rate, according to Gouws (cited by the dept. of justice, 2001):

1. Long term: Inflation differentials - the internal estimation of an economy's money falling faster than the internal estimation another country, then the external value of that currency would, over time, reflect that difference.
2. Short & medium: macro-economic factors; perceptions/sentiment.
3. Short term: the role of the Reserve Bank; speculation.

It is also expressed visually in the diagram below

Figure 2.4 Determinants of Exchange Rate



Source Dept. of justice

Thus since investment depend on this exchange rate, as Darby *et al.* (1999) wrote, that increased uncertainty created by expanding interchange rate unpredictability which could make investment diminish our next section is investigate investment.

2.7 Investment

The influence of volatile exchange rate on investment is considerably an open deliberation, on the grounds that the outcomes by various studies are uncertain. Investment is defined in The Compact Oxford English Dictionary as “1. The action or process of investing. 2. A thing worth buying because it may be profitable or useful in the future.” According to Reungsri (2010), investment in literature is usually taken to refer to increases in the capital stock.

However it can be simply put as a commitment of funds made in the expectations of some positive rate of return. The most important thing to note is the expectation of returns that is an essential element of an investment.

2.7.1 Types of investments

There are different types of investment; however, the ones mention are derived from Maepa (2015).

- Ownership investments – Ownership investments is defined as the type of investments which investors procure in exchange for the ownership of a portion of a company, or corporation. Ownership investments emanate in a variety of forms, including stocks, which are defined as the type of ownership investments which entitles investors to a portion of the corporation's earnings. Ownership investments may also be in a form of investing in a business by starting a business or through the acquisition of a business domestically or in another country. Another form of ownership investment relates to the purchasing of real estate. Another form of ownership investment is the investment in inventory, which is purchasing production inputs or stocks that are to be sold at some stage during the course of the business activities.
- Debt investments – An investment whereby investors are permitted to acquire a portion of a corporation through the purchase of either bonds or debentures. This acquisition yields interest to the investor at the end of each financial period that the acquisition is made.

2.7.2 Factors Affecting Investment

There are literatures on the factors affecting investment thus causing it to fluctuate. Udoh and Egwaikhide (2008) wrote that returns on investments depend on different factors. For instance, the earnings on foreign investment are elements of external causes such as foreign economies, foreign interest rates and macroeconomic policies. Alternatively, earnings on domestic investment depend on factors such as local market structure and organizations, expected structural reform, positive short-term macroeconomic strategies and openness of the economy. In agreement with that Mpofu *et al.* (cited by Maepa, 2015) categorised some of these risks as seen below:

- Exchange rate – Exchange rate is when an investment's rate of return declining due to a decline of interchange rate in an economy whereby investment is permitted.

- Inflation – Inflation is when investment's return rate is dwindling due to the current inflation rate, leading to a decline of investment.
- Interest rate – Interest rate is when domestic interest rates fall, that in turn results in a negative effect on investment.
- Political stability – Political instability is the change in legislation that may lead to political and social unrests, which may adversely affect an investment.
- Openness of a country – It is a measure of economic policies that either restrict or invite trade between countries. High trade tariffs, can restrict the desirability of international trade, this restrictive policy will discourage investment (Yanin, 2010).
- Taxation – when choosing a country to invest, tax rates assumes a vital part in this selection by multinational corporations since corporations will probably pick a country with low rates. Thus high tax rates will discourage investment (Kassahun, 2005).

2.7.3 Exchange Volatility and Investment

A currency's unpredictability has been distinguished regularly as a substantial issue for the flow of investment in a country. Investments are usually put on hold if the currency in the host country becomes strong, however investment continues with the intention of maximizing their profit because of speculation of the currency to depreciation in the future (Barrell and Pain, 1996). According to Melku (2012) and Vernon (1966), a country's depreciated currency in relation to other countries' currencies will lower the labour and the price for production in a making the location advantageous for foreign investors to exploit.

It is contended by analysts that vigilance must be practiced while inspecting the unpredictability of currency amongst host countries, due to the fact that the significance of alterations in exchange rates to nations can differ in view of the objectives and tactics of a particular nation. It is general knowledge that increased risks and uncertainties caused by exchange rate volatility, consequently influences investment.

Then again exchange rate unpredictability exercises both encouraging and discouraging effect on domestic investment, because volatility affects prices causing them to be volatile. Hartman (1972) wrote that increased volatile prices may prompt more elevated amounts to be invested by competitive risk-neutral organisations that attempt evade instability later on. In another argument, Dehn (2000) wrote that Volatility of future prices has no effect on investment decisions. That is because in developing countries investors are exposed to other major issues

that cause uncertainty such as uncertainty in the political environment and economic policy changes to exogenous weather shocks, infection, and civil strife.

2.8 Investment in South Africa

During the 1970s and early 1980s, African countries witnessed a slow economic growth, hence to restore the declining rate it was a unanimous solution to work on increasing of total investment (Oshikoya, 1994). To support that observation, Gómez (2000) wrote that economic growth uses investment amongst the most essential measures used to clarify it. Ever since then various governments of African countries have made their main goal to increase investment in Africa, both foreign and domestic. With that established, South Africa is amongst countries with high investment rate in sub-Saharan Africa.

There have been some changes in the investment pattern in South Africa over the years. Gelb (2002) said investments were vigorously affected by sanctions and boycotts decades back in South Africa. The result during apartheid was low foreign investment causing domestic investment to become the hub when with contrasted with Foreign Direct Investment, though the country saw a transformation when the democratic government came into power in 1994.

In April 1994 after the change of government, FDI regulatory experienced administrative transformation and progression in the nation (Asafo-Adjei, 2007). However, after that FDI inflow grew at a very slow pace because mega businesses in South Africa remained controlled by their respective segment and had expanded into other parts during the Apartheid era. That can be attributed to the South African government implementing incentives to increasing private investments such as lowering interest rates and tax holidays through various treaties (Adrino, 2012). Thus when the economy opened, foreign investors were adamant to invest into the country where these corporations were the major players as competing with them would be hard (Lagace, 2006).

In the domestic investment front, after all the incentives put in by government, only a few companies took the opportunity. However, generally South Africa's private sector investment sustained growth but at a slower speed. This is due to the fact that, businesses in South Africa refrain from substantial fresh projects developments in an environment of weaker business confidence, domestic supply constraints and low demand levels (SARB, 2011). Then government extended credit to the domestic private sector in form of loans, purchases of non-

equity securities, trade credits and other accounts receivable that establish a claim for repayment, this extended credit plan worked (Adrino, 2012).

As the years went by the economy created an environment for both domestic and foreign investment. Investment in the automobile sector in South Africa became a most notable goal for the EU over the previous decade, trailed by US and Japan. Around 1994 to 1999 the Mining industry also brought investments because of its availability in South Africa. (Hanouch and Rumney, 2005). As fiscal incentive agenda, 100 percent of credit was issued since 2006 to 2010 by the government to support capital development capital formation strategic industries and industries that would add value to South Africa's abundant mineral resources. That was coupled with the outlays for the FIFA 2010 world cup (SARBS, 2011) where the South African economy was booming with investments.

2.9 Investment Theories

2.9.1 Life Cycle theory of Investment

The theory presumes that investors go through stages of investment which are the accumulation phase, consolidation phase, spending phase and finally the gifting phase, in order to accumulate wealth (Modigliani & Miller, 1958).

The first stage which is the accumulation phase, people just started their jobs between the ages of 20s to late 30s with their main focus on cars and houses instalment, cost of marriage and their long term focus is on retirements and children's education.

The second stage, consolidation phase, people are in mid- life between the ages of 30s to 40s. Accumulated asset are used up on children's tuitions and college needs, and family holidays. Long term focuses are on retirement plans.

Third stage known as the spending phase, there has been accumulation of assets by individuals from previous stages, enough income and capital was amassed to be inherited by kids or to be given to charity.

The final stage is the gift stage. It is a stage where individuals have preferences change. This is a stage where individuals are careful about the things they invest in; they now opt to invest in low risk assets. As young people their hunger for accumulating much assets influenced their decision in investing in high risk asset because the higher the risk the higher the return.

2.9.2 Neoclassical Theory of Investment

Neoclassical investment theory by is by Dale Jorgensen. The Jorgenson theory was of optimal capital stock than optimal investment (Hibbs, 2011). However the neoclassical model was criticized, for it was not able to estimate investment function for developing countries (Al khatib. *et al.*, 2010).

The neoclassical hypothesis clarifies, that capital stock of a firm for can be accomplished within a specific time. Thus the hypothesis states that a firm's altered capital stock toward desired level controls investment at a speed. However a desired level of capitals stock cannot be reached because it takes time to build and mount new machines, build new factories and many more. Thus before making alterations to the capital stock, the firm makes that decision on the rate or speed to go in order to achieve the desired level. The firm, in order to produce goods and services to sell in the market, employs the use of capital and labour. Nevertheless the quantity of capital and labour to employ are mainly determined by the impact they have on the production and revenue of the firm, and not the factors expenses. The hypothesis states that investment is controlled by marginal product of capital (MPK). It is an additional stock of capital in the economy and the customer cost of capital likewise called real rental cost of capital marginal product of capital measures increased production that utilizing labour, an extra unit of capital, and innovation stay consistent.

The overall procedure based on the law of marginal diminishing returns states that as more units of capital are added to production with other factor remaining constant, they would result in a decrease in marginal product of capital. Maximising profit is a firm's aim, hence providing the rate of marginal product of capital (marginal receipt or advantage by the utilization of capital in manufacture) surpasses the rental or user cost capital, it will be gainful for the firm to add to stock of capital.

It will expand its benefits when it has accomplished the stock of capital at which marginal product of capital (MPK) breaks even with user cost of capital. It can be determined by the stock of capital by utilizing the neoclassical production function which is prominently known as Cobb-Douglas (Mukherjee, 2015).

Hence with the help of Cobb-Douglas model for further explanation (Hibbs, 2011):

$$Q = AK^{\alpha} N^{1-\alpha} \quad (1)$$

The static FOC is

$$F1K = AK^{\alpha-1}N^{1-\alpha} = r_K \quad (2)$$

$$\alpha QK^{-1} = r_K$$

Hence the conditional, desired stock of capital (conditional on the level of output) is

$$K^D = Q \frac{\alpha Q}{rk} \quad (3)$$

Jorgenson proposed in ad-hoc fashion a mechanism for the adjustment of actual to desired capital stock (because of unspecified costs) along the lines of

$$(K_{t+1} - K_t) = (1-\gamma) (K^D_t - K_t), \gamma \in (0;1) \quad (4)$$

$$= K_{t+1} = (1 - \gamma) \sum_{j=0}^{\infty} \gamma^j K^{\frac{D}{t-j}}$$

Given (3) the observed capital stock would be

$$K_{t+1} = (1 - \gamma) \sum_{j=0}^{\infty} \gamma^j \frac{\alpha Q_{t-j}}{rk_{t-j}} \quad (5)$$

Hence investment is a drives capital formation, thus an equation for capital formation equation

$$K_{t+1} - K_t = I_t - \delta K_t$$

$$I_t = K^D_{t+1} - (1-\delta) K_t \quad (6)$$

From which it follows given (1) that investment is driven by

$$I_t = (1 - r) \sum_{j=0}^{\infty} r^j \frac{\alpha Q_{t-j}}{rk_{t-j}} - (1-\delta) K_t \quad (7)$$

An equation of this sort became known as a flexible accelerator neoclassical model

2.9.3 Accelerator Theory of Investment

The accelerated theory of investment implies that if there is a change of output rate in a country, it is reflected in investment (Agarwal, 2010). Thus the theory advocates that the rate of demand growth and investment share a positive relationship. It further suggests that for every given level of output and interest rate, there is a preferred capital stock. Therefore firms may regulate to gain new capital stock level, thus compelling a rise or a fall of output and

interest rate respectively causing an effect to the investments levels. The accelerator model defines the desired capital stock as:

$$K^d = \alpha Y_t$$

Where K^d demand for capital stock is defined as a proportion of output, Y_t because it takes firms some time to obtain new equipment, capital stock is adjusted optimally to the difference between the capital stock in the current period and actual capital stock in the previous period (Eita, 2007). Then net investment can be written as:

$$I_{net} = K_t - K_{t-1} = \alpha(Y_t - Y_{t-1}) \quad 0 < \alpha < 1$$

Where α is the accelerator coefficient, and it represents the desired capital-output ratio (K/Y). This means that given a change in aggregate demand, the accelerator gives the change in capital needed to achieve the desired capital-output ratio.

Assuming that I_t^* is a desired investment determined by accelerator and if I_t is actual investment, a linear partial rule can be imposed:

$$I_t = \mu I_t^* \text{ where the parameter } \mu \text{ lies between 0 and 1.}$$

In order to prove the theory, most empirical studies done on the accelerated investment theory show that there is a positive association between economic growth and investment. Thus, any country seeking elevated growth levels should increase investment in that country. This means that for any economy to develop and flourish, it requires a massive amount of capital goods (Agénor & Montiel, 1999).

2.9.4 Q- Theory

Jim Tobin (1969) developed an intuitive and celebrated theory of investment. The q-model is a type of neo-classical model that relates investment spending to the ratio of the market value of the firm as determined by an additional unit of capital to its replacement value (Tobin, 1969). Investment rises when the marginal q exceeds one and declines when it falls below one (Ferderer, 1993). In a number of empirical literatures done, they concentrated on the relationship between investment spending and the average q, that is, the ratio of the market value of the firm to the replacement cost of its assets

The relation between average q and gross investment is given by Ferderer (1993) as,

$$I_t = \alpha + \sum_{i=0}^m \beta_i q_{t-i} + \delta k_{t-1} + \epsilon_t$$

Where gestation lags are accounted for by letting m exceed zero.

2.9.5 *A Keynesian Alternative Investment Theory*

This is an investment theory presented by Myron Gordon, an author who concluded that all five core prepositions of the neoclassical theories he identified are false. Some of the assumptions he criticised (Crotty, 1993) are:

- **Objective function of the enterprise:**

Detached proprietorship and administration of contemporary business were issues identified by Keynes as an essential of many problems faced by the modern capitalist. On the other hand neoclassical investment theorist failed to recognize the presence of the issue. Practically the entire neoclassical models of business investment choices starts unaided with knowledge about firms objective is solely the goal of the firm owner (hence both firm and owner are one and same) which is the firm maximizing market value.

Based on the understanding of market value, some points to be taken into account, assumption supplied by the neoclassical theorist is proved false with empirically and institutionally evidence. Thus if this assumption is rejected, there is no clear distinction that can be pointed out, hence with the absence of that the neoclassical theorist generally has not decided on a technique for selecting a business role in stating the restriction or recognising the cost of capital.

Lastly when businesses are semi-independent from the owners, meaning they are capable of making investment decisions opposite that of the shareholders clear interests, there is no wealth holder over the capital accumulation process and there is no mechanism to make certain optimal coordination between the real and financial sectors of the economy. Hence when management is partially independent, the real sector also is partially independent. This is something the neoclassical theorist views as inconsistent.

- **Neoclassical risk or Keynesian uncertainty**

The Neoclassical theory assumes that numerical possibilities can be assigned to conceivable upcoming state of economy subsequently relating to a circulation of anticipated earnings with each conceivable decision accessible. To them, Keynes view was that the needed information in order for best choice, (upcoming net revenue generated by every prospective investment project) does not exist hence cannot be known at the moment it's needed.

- **Physical capital as a liquid assets**
- Every neo classical model that proved consistent with their theory of a market that's successful and reliable states that there is an ideal resale market that can be attained for an old capital asset that is still in perfect condition. In usage Tobin's - q theory and the Jorgenson models are perfect examples. Thus, with such theory by the neoclassical, investment decisions have no risks and are reversible. The assumption of reversibility denies uncertainty of its sting because it renders mistakes relatively costless (Crotty, 1993)

Models of investment decision are to adopt Keynes ideology that capital goods are specifically created for a business, hence making the process of capital accumulation naturally risky. Therefore equipment undergo substantial loss in market value when it is produced, and when it is installed and incorporated in a large system for production because they were made for a specific firm to be used for a specific purpose.

Investment is determined via management choice for growth in relation to safety according to the Keynes theory. Investments are highly influenced by expected profit rate; higher profit will increase the flow of expected profit flow to owner and creditors relative to cash flow, which would increase growth and safely at the same time. However if the confidence of the management is shaky in its decision to predict conditions, this will dampen investments.

Reason for formation of investment model is firstly because capital arrangements are important; incentives are put in place by the firm to try to regulate its competitive environment. Secondly, the theory lays on strong necessity of various practical relations and restricted qualities (management's degree of risk-aversion; the frame and the solidness of the desired outcome and certainty producing capacities). Finally it's reflective of the broad outlines of historical record than the neoclassical investment model, and therefore, assists to strengthen Keynesian alternative to the neoclassical Vision (Crotty, 1993).

2.10 Exchange Rate Theory

2.10.1 Purchasing Power Parity Theorem

Cassel in 1918 founded this theory, the PPP theory is the measurement of a currency's buying power in contrast to another when the exchange rates are considered. The uniformity of the purchasing power of the different money creates exchange rates among the currency of the

two countries. Should different inflation rates amongst the two countries be recognized, this will cause rates of exchange to acclimatize and tally with relative purchasing power of the currencies. The theory is assumed under the concept that there are no restrictions in trade thus any alteration in the rates of exchange reflects a difference in the price level in both countries relatively. Thus if the concept is based on no restriction between the countries, then the similar commodities in the countries should have the same price because investors that profit from price inefficiencies take advantage of such conditions until price dissimilarities are eradicated. This brings the law of prices to effect which assumes that one commodity validity should be valid of the economy all together. The concepts of rates of exchange are entwined with that of inflation rates because both countries' price levels have been linked through rates of exchange. On the off chance that the hypothesis does not hold, it can be concluded that purchase parity does not exist between both currencies (Madura, 2007).

2.11 Empirical Reviews

The theoretical models are quite ambiguous when it comes to the relationship between exchange rate volatility and investment; the empirical studies are more or less similar as there are no definite conclusions on the effect of exchange rate volatility and investments. Studies on exchange rates volatility on investment, both foreign and domestic, that have been conducted used different econometric techniques and variables. All these studies had a common aim, being to examine the short and long run effect of exchange rate volatility on investment, and whether exchange rate volatility increases or decreases investment. Most studies have, however used the autoregressive conditional heteroscedasticity (ARCH), general ARCH (GARCH) and the standard deviation method to check for volatility of exchange rate. Available empirical studies on the subject would be reviewed.

In their study, Dhakal *et al.* (2010) inspected the impact of exchange rate volatility on FDI and used panel data. Countries examined were China, Indonesia, Malaysia, the Philippines, South Korea, and Thailand because they are nations that have kept on drawing in impressive FDI inflows while additionally encountering a lot of instability in the rates of exchange. They utilized the GARCH technique. The general estimation results were in harmony with the predicted theory. The results indicate that exchange rate volatility has a positive impact on the FDI in the countries sampled.

In this study, Kyereboah-Coleman and Agyire-Tettey (2008) adopted ARCH and GARCH models to measure how volatile the rate of exchange is, for the short and long relationship between the variables. The Johansen co-integration and ECM were used. Results indicated a negative relationship between exchange rate volatility and FDI in Ghana. It was discovered that while both the stock of FDI and political factors are likely to attract FDI, most foreign investors do not consider the size of the market in making a decision to invest.

Also, Musyoki *et al.* (2012) in their study examined the impact of real exchange rate volatility on economic growth in Kenya. Their study utilised the GARCH and unconditional standard deviation of the changes to measure volatility and Generalized Method Moments (GMM) to assess the impact of the real exchange rate volatility on economic growth. The result of their study showed that real exchange rate was volatility for the entire study period. Kenya's RER generally displayed appreciating and volatile trend, implying in general that the country's international competitiveness deteriorated over the study period. The RER Volatility reflected a negative impact on economic growth of Kenya.

Azee *et al.* (2012) examined the effects of exchange rate volatility on macroeconomic performance in Nigeria. The study used OLS and Johansen co integration estimation technique to test for the short and long run effect respectively. The result found that the RER volatility contributes positively to GDP in the long run.

In another study, Ogunleye (2009) investigated the exchange rate volatility and foreign direct investment in sub-Saharan Africa: evidence from Nigeria and South Africa, the system two-stage least squares methodology adopted the exchange rate volatility variable was obtained using the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model. Their findings revealed that exchange rate volatility has deleterious effect on FDI inflows, with FDI inflows aggravating exchange rate volatility in both countries. Exchange rate volatility is driven largely by inflation, as well as nominal and foreign reserves shocks in both countries.

A paper by Mahmood, Ehsanullah and Ahmed (2011) indicated that the relationship between volatile exchange rate and GDP is positive and as well as trade openness; however, with FDI I is a negative relationship. Their study was to investigate the relationship between Pakistan exchange rate volatility and FDI, GDP and trade openness. The inspection was to assess if fluctuations in exchange rate volatility in Pakistan and how it affect FDI, GDP and trade openness from the year 1975 to 2005 annual data was used. The dependant variable exchange

rate was used in study. To calculate the volatility in the exchange rate they used GARCH (1, 1) model.

In south Africa Bah and Amusa (2003) explored the real exchange rate volatility and foreign trade using the autoregressive conditional heteroskedasticity (ARCH) and general ARCH (GARCH) models to investigate the impact of the real exchange rate volatility on South Africa's export to its largest, single-nation trading partner the United States (U.S). The results indicate that the volatility of the Rand's real exchange rate exerts a significant and negative effect on exports in both the long and short-run, while the decline in real exchange rates has a positive impact on exporting activity.

Udoh and Egwaikhide (2008) studied the linkage between inflation and FDI; they used annual time series data covering the period 1970 to 2005 to examine the effect of exchange volatility and inflation uncertainty on FDI in Nigeria. The GARCH model was used to estimate inflation uncertainty and exchange rate volatility. Their result showed inflation has a negative effect on FDI and it is statistically significant.

Maepa (2015) provided an analysis of the impact of exchange rate volatility on South African investments. The study explored the impact of exchange rate volatility on various investments in South Africa from 1970 to 2014. The Vector Autoregressive model (VAR), a multivariate Johansen co-integration approach and Granger causality test were conducted to analyse the relationship. The results showed there was a long-run relationship. The study showed that exchange rate and different types of investments in South Africa have a negative, long-run effect on the exchange rate, suggesting that a fall in the investments would cause an increase in the exchange rate in the long-run.

2.12 Summary

Previous discussion on the literature uncovered extremely intriguing measurements to the linkage between exchange rate and investments. From the theoretical literature reviewed, the relationship can be either positive or negative. Furthermore, analysis from available empirical literature indicates that it may not be possible on a priori grounds to arrive at any definite conclusion on the relationship between exchange rate volatility and investment. The issue is basically empirical and critical depends on the type of method used in the analysis the economy being considered. The next chapter provides an overview of South Africa macro-economic environment.

CHAPTER 3

OVERVIEW OF SOUTH AFRICA'S MACRO ECONOMIC ENVIROMENT

3.1 Introduction

The objective of this chapter is to present an overview of the macroeconomic environment in South Africa. This chapter is divided into six parts, which would include discussion on the trends. First is the Introduction; second, South Africa overview; third, Economic growth; fourth, Investments; fifth, Inflation; sixth, Interest rates. Finally closing comments are given towards the end of the part.

3.2 South Africa Overview

South Africa is a southern African country, has a coastline stretching more than 2,500 kilometres. It shares international borders with Namibia on the Atlantic (western) coast southwards around the tip of Africa and then northeast to the border with Mozambique on the Indian Ocean. The country is a medium-sized country, with a total land area of slightly more than 1.2-million square kilometres. In the continent it has 3% of the surface, the country has nine provinces, the most populated being Gauteng, a highly urbanised region, and the largest the vast, Northern Cape, which takes up almost a third of South Africa's total land area (South African year book, 2015). South Africa is ranked by the World Bank as the upper middle-income country; it listed its GDP at \$350.1-billion (R5.416-trillion) and its population at 54 million in 2014.

Figure 3.1 South Africa Map



Source: southafrica.info

South Africa is termed a dual economy by the World Bank with one of the highest inequality rates in the world. It has an income Gini of around 0.70 in 2008 the top decile of the

population accounts for 58% of the country's income, while the bottom decile accounts for 0.5% and the bottom half less than 8% (World Bank, 2016).

The South African economy heavily depends on the mineral resources; it is biggest producer of gold and platinum as well as the leading producer of base metals and coal. The country stands as the fourth largest diamond producing country, the industry accounts substantially for both the world production and reserves, and globally in various sectors the mining companies dominate. The country's 4.9% of mining and quarrying subsidized GDP in 2013 (World Bank, 2016).

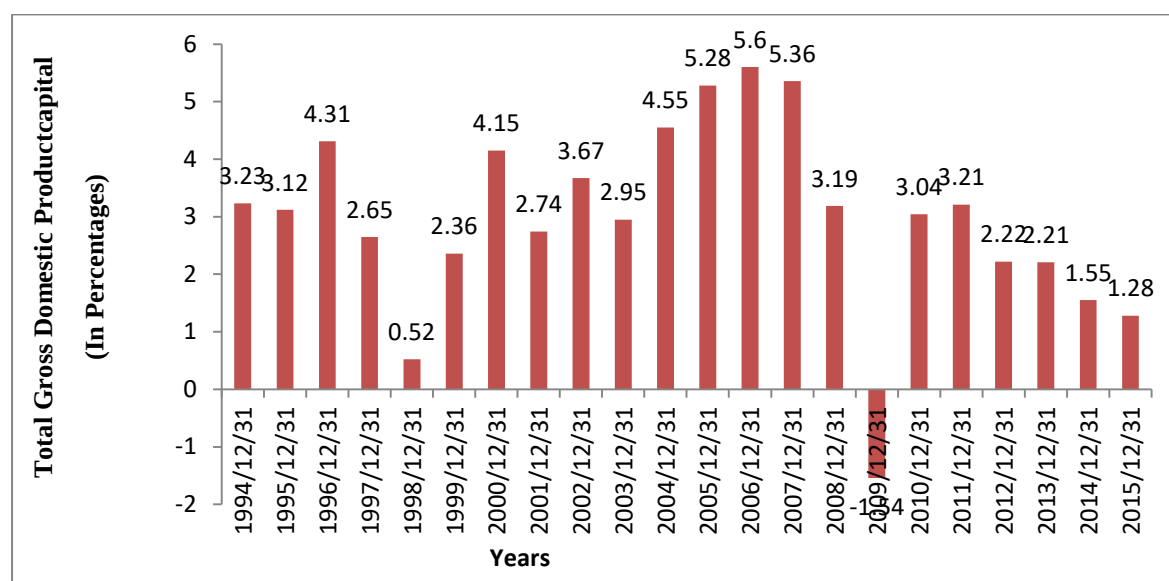
The country is renowned for its fastest growing paces, with an outstanding free-market economy amongst African countries. Statistics South Africa (STATSA) reported the GDP Annual growth Rate has been an average of 2.95 percent from 1994 until 2016, reaching an all-time high of 7.10 percent in the fourth quarter of 2006. The Per capita income continues to grow. It is developing, public services are growing, wellbeing indicators are enhancing, corruption rates are dwindling and demographic patterns are positive. The public finances are in a better shape than of other African countries. The financial system is in an advantageous position and its core inflation is steady and within the central bank target zone (OECD, 2013). Hence due to such strong macroeconomic environment, the country managed through different situations.

3.3 Economic Growth

Before 1994 South Africa had a slow economic growth. This was caused by the country going through a political flux, such as the political isolation and economic sanctions. During those times manufacturing arrangements were encouraged in the direction of import substitution and independence in tactical goods. Weak competition laws, incredible industrial premiums and different restrictions on business exercises, joined with an absence of enthusiasm from foreign investors prompted to rising levels of attentiveness in the proprietorship and erection of manufacturing sector. This established an unfriendly atmosphere for new participants, black-owned ventures and micro ventures. As a result the country faced depressing economic performance in growth rate (Nowak and Ricci, 2006; Sibanda, 2012; Harmse, 2006). However, 1994 brought an end to the apartheid regime and the country reintegration with the world economy and globalisation. There was thus a significant improvement to the country's economic growth (Faulkner and Loewald, 2008). This was demonstrated by a set of key structural changes that the economy underwent during

that period. These structural shifts are manifested in four key outcomes the first being the share of Mining in GDP which stood at 11% in 1994. Secondly, the manufacturing sector constituted 19% of total output in 1994. Thirdly, the key sectoral growth engines the financial and business services sector constituted 17% in 1994. The Figure below features an overview of the trends in economic growth for the period between 1994 and 2015.

Figure 3.2 Gross Domestic Products (Constant Price) in South Africa (1994-2015)



Source: Data compiled by Quantec (self-made graph)

The economic growth of the post-apartheid economy showed a solid growth; the growth in real gross domestic product (GDP) of 1995 shows 3.12 percent. In 1997 the GDP indicated an abrupt drop to 2.6 per cent from 4.3 per cent in 1996 2 which was accredited to the impacts of the worldwide crisis. The Asian crisis and the world downturn were other causes of this bleak performance (Du Plessis, Smit, and Sturzenegger 2007). Nevertheless, from 1999 to 2000 a healthy growth which averaged 4.3 is indicated. This growth trend was an improvement, but progress slowed down with a decrease in growth in 2001. Then South African economy enjoyed positive and sustained growth rates with 2006 recording a growth rate of 5.6 per cent, the highest since 1981(Sibanda, 2012). In 2007 the rate dropped to 3.6 per cent. GDP growth continued to decline in 2008 and as seen from the graph above, there was a massive decline in the GDP in 2009 and for the first time the country faced a negative growth rate of negative 1.5 per cent for the year as a whole. Conversely 2010 brought alleviation as seen on the graph an improved growth rate to 2.9 per cent.

3.3.1. Growth Policies

After emerging from the apartheid era there were challenges that the new government faced, hence several objectives were put in place to reduce macro-economic challenges including economic growth (Khamfula, 2004). It is largely accepted that long-term economic growth of a country will lead to a substantial improvement in the standard of living of its citizens (Akanbi, 2010). Therefore supported growth since 1994 in South Africa could not have been grasped without the guide of suitable government policies, methodologies and projects (Vermeulen, 2015).

3.3.1.1 GEAR

Macroeconomic policy reforms such as the Growth Employment and Redistribution (GEAR) implemented in 1996 entailed the liberalisation of markets, private sector participation and the integration of the economy with the rest of the world. The GEAR key goals were; advancing growth with a specific end goal to create jobs work for the jobless; reallocating pay and creating prospects for poor people; making the general public access good health, training and different administrations; and an empowering the situation in which homes are secure and work environments are beneficial. These reforms led to an increase in real the GDP growth from an annual average of 4.3 per cent in 1996 to 5.1 per cent in 2007 (HDR, 2009; Hanival and Maia, 2010).

3.3.1.2 AsgiSA

Economic growth and structural changes were not enough to make meaningful impression on unemployment and destitution levels, hence the targets of RDP and GEAR could not be completely reached. Thus the government resorted to the initiation of Accelerated and Shared Growth Initiative South Africa (ASGISA) in 2004. It encouraged the diversification from commodities specialisation to service sector specialisation. This saw the advent of the Accelerated and Shared Growth Initiative South Africa (ASGISA) in 2004, which was made with the aim to increase economic growth to above the 6 per cent mark by 2010 (IMF, 2006). The development of infrastructure, upgrading and building of the energy infrastructure, railways and ports, as well as the road network were matters that the ASGISA was concerned with. In any case AsgiSA intended to be a planning agenda environment for various arrangements and vital events, including a few components that were basic to GEAR and the main aims supporting the RDP idea (Hanival and Maia, 2010).

3.3.1.3 RDP

In 1994 the Reconstruction and Development Programme (RDP) was initiated with a sole reason to expel racial predispositions from the economic and social organisation of South Africa. Apartheid, although ended, saw most South Africans left in poverty with limited access to adequate education, causing the affected to be left out on higher skilled employment opportunities, good health care and better housing conditions (Government Gazette, 1994).

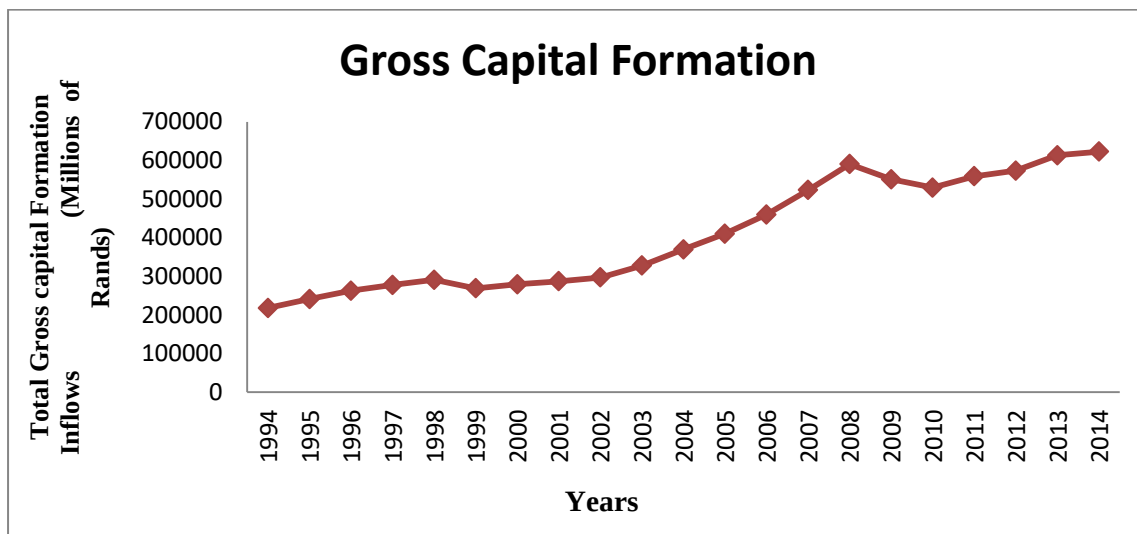
3.4 Investment

A key determinant of economic growth, according to Maqbool, Maaida and Sofia (2010), is investment. Consequently, understanding a good investment climate provides opportunities and incentives for investors to invest profitably, create jobs, and expand national output thereby increasing economic growth (Siraj, 2014).

Types of investments the first one being FDI which is the procurement of assets in another country. In this sort of investment, the investors own controlling stake and have long term interest, hence it may be termed as a long term investment, while on the other hand portfolio investment is an investment in stock or bond and financial markets. They are short-term investment, highly volatile and largely unproductive, and can move rapidly from one country to the next (CUTS, 2001).

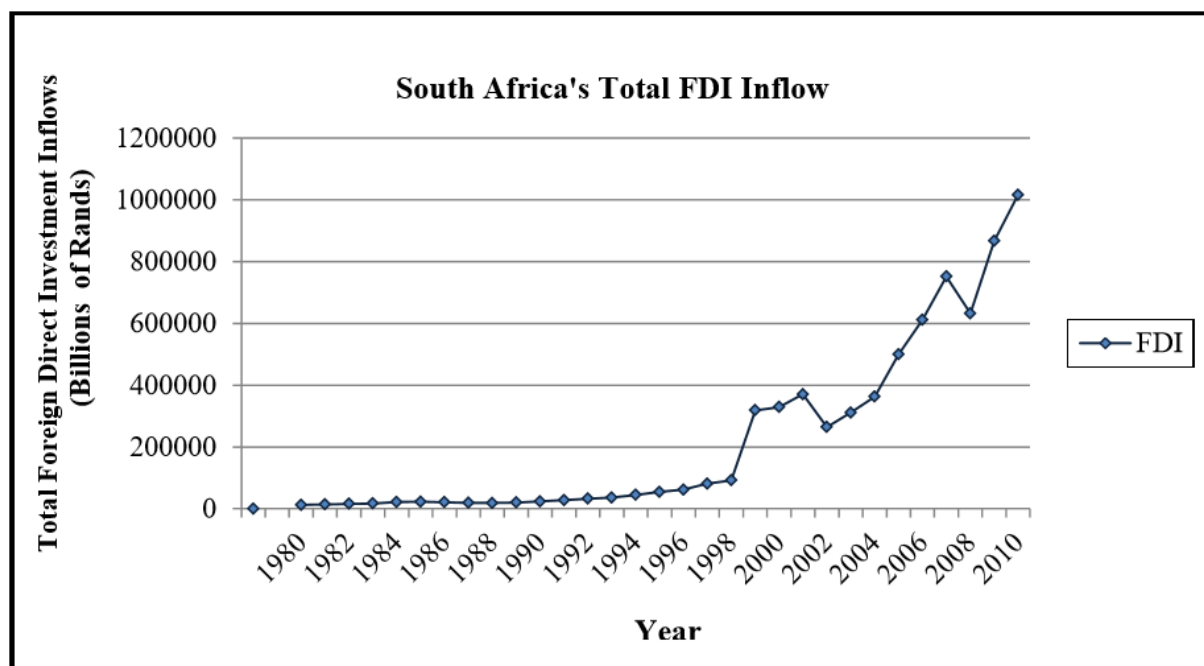
Solow (1956) stated that countries that invest a considerable fraction of their Gross Domestic Product (GDP) grow rapidly, while countries that invest slowly in their economies develop slowly and remain poor. The World Development Report (WDR) resorted to suggesting that in order for improvements in an economy's investment climate, the key is to increase the flow of investments and, consequently, a higher level of economic growth and development.

Figure 3.3 Gross Capital Formations in South Africa (1994-2014)



Source: Data compiled by Quantec (self-made graph)

Figure 3.4 Foreign Direct Investment Inflows in South Africa (1980-2010)



Source: Graph adapted from Adrino (2012)

Prior to 1994, the South African government executed different motivating forces; for example, increasing interest rates, tax holidays, different arrangements and activities with the point of expanding investment and simultaneously inducing economic growth (SARB, 2011). In spite of, those means the investment in the country was very slow as both the Domestic investment and foreign direct investment, which can be seen in the FDI graph above. FDI

fluctuated below R33 million while Gross domestic fixed investment took significant slump during the period from 1980 to 1994. This has been attributed to the disinvestments and outflow of foreign capital of the 1980's emanating from the political isolation of the apartheid regime (Sibanda, 2012; Adrino, 2012).

Indicated on both graphs, is how conditions improved when the abolition of sanctions and disinvestment ended in 1994. There was an increase of FDI from R33 million in 1994 to R1.3 billion in 1995. Simultaneously the Gross fixed capital formation followed an upward trend from 1994 to 1996. This clear progress was due to the country finally being economically independent and the successful unrestrictive admittance of the international community to trade (Du Toit and Moolman, 2004; Mnyande, 2010; Arvanitis, 2005).

However, from 1998 to 2000 there was a significant drop in investments. This was more evident in gross fixed capital that showed a decreased by 7.60 percent in 1999 and FDI which wavered between R3.1 billion in 1998 to R9.1 billion in 1999 and finally R6 billion in 2000. These changes were attributed to the interest rates in 1999 of 18.69%; the Southeast Asian Crisis was also a factor (Du Toit and Moolman, 2004; Arvanitis, 2005).

In 2001 ended the downward trend because investments increased. FDI documented R58.4 billion increase, this was accredited to the purchase of De Beers minority shareholders by Anglo American and the offer of strategic stake in Telkom, which was a completely government claimed monopoly. From then FDI faced fluctuations were observed with R944 million in 2002 then R824 million in 2003, 2004 saw R5.1 billion and closely followed by an increase of R39.7 billion in 2005. FDI in 2006 recorded –R3.4 million, then in 2007 thing took a turn when FDI levels was R7.1 billion although in 2008 it slightly decreased to R6.3 billion and recovered to R7.2 billion in 2009. On the other hand gross domestic formation had a stable flow from 2001 to 2008 (Reserve Bank, 2013).

The year 2009 caused both investments to face a sudden decline due to the global financial crises that affected many economies and the effects spilled over to 2010; then again 2010 displayed a positive FDI inflow of R10.2 billion which was accredited to the country integrating into the BRICS (Brazil- Russia- India- China- South Africa) initiative in December 2010 (UNCTAD, 2013; South Africa year book).

3.4.1 Policies on investment

As many studies have shown, investment is an important contributor to the development and growth of a country, thus strategies to encourage investment developed into an important

strategy (Addison and Heshmati, 2003). As a result government started putting policies in place to attract more investments of which MERG reasoned that a good investment environment is one formed through liberalisation, lowering of tariffs and non-tariff barriers to conform to GATT minimum requirements (Adewale, 2008).

Thus we look into policies that can be identified in the country.

3.4.1.1 Tariffs

MERG indicated that the apartheid era had over 12,000 tariff lines, and hundreds of tariff settings and numerous other duties designed to bolster the protectionist trade policies of the regime (Adewale, 2008). However, presently the country as a moderately open economy it is still been protected by tariffs (DTI, 2015). The country's tariff and non-tariff barriers have an important impact on investment (Asafo-Adjei, 2007).

To discuss some of these tariffs, South Africa has accepted considerable tariff cuts since 1994; the average tariff is 8.3% in 2015 compared to the 23% in the 1990s. In 2006, the proportion of zero-rated tariff lines rose to about 54%; by 2015 it increased to 56%. Comparing the country's tariff regime to their partners major simplifications have been made to it, making it transparent and not overly complicated (ITAC, 2010; DTI, 2015).

However, Asafo-Adjei (2007) mentioned that foreign investors find barriers to entry and non-competitive environments less appealing. Although studies showed that foreign investment is also discouraged by high tariffs or non-tariff barriers on imported inputs and are rather more attracted to more open economies. She further stated that high measure of taxes actuates investors to set up procedures in host nations with bigger markets or bigger markets with potential in order to evade the cost forced by such hindrances.

3.4.1.2 Investment incentives

Another policy is the investment incentives. The DTI (2009) mentioned how the South African government has put incentives in place as forms of Fiscal and Financial enticements to encourage foreign and domestic investment in the country.

Macroeconomic Research Group explained that with investment incentive accelerating depreciation is necessary; carryover tax credits should encourage investment ventures with low initial profits; training and skills development should be encouraged through corporate tax-cuts. All in all the investment incentive should be prolonged and concentrated (Adewale, 2008).

The Fiscal incentive is a specific deduction and capital allowance on the Income Tax Act (Wentzel, 2010). Adewale, (2008) also explained that fiscal incentive included the Value Added Tax (VAT), custom duties, excise taxes, capital transfer tax, wealth taxes, tax on fixed property and other taxes, which include stamp duties, securities tax, financial transactions tax, turnover tax, employment or wage bill tax .

Asafo-Adjei (2007) also explains it as a policy that is considered to decrease the tax burden of a company. The fiscal incentives are in two forms the first being the tax based incentives, which are the reduced corporate taxation and special tax-privileged zones while the non-fiscal incentives are the subsidies and preferential loans, investor facilitation and after-care facilities, and increased engagement between government and business (SIAII, 2012). This is to encourage direct investment (DTI, 2009). The benefit gained from the fiscal encouragements is that they can easily be granted without sustaining any financial costs (Wentzel, 2010).

The other incentive is the financial incentives which are direct contributions by government to the firms in form of direct capital subsidies or subsidised loans to encourage them to invest (Asafo-Adjei, 2007). Grants and subsidies which are forms of financial incentive are imperative to the lowering of investment costs and therefore reduce initial project risk.

With the financial incentive, government controls it and as a result government decides which industries, firms, transactions, products, types of equipment, geographical location and targets the incentive towards those particular areas (Wentzel, 2000). The benefit of the fiscal incentives is that they are favoured by the host nations because of the fact that can be effectively conceded without bringing about any financial charge and quite rigid in individual cases (Smith, 1991; Lim, 2005).

3.4.1.3 Removal of restrictions

During the apartheid period there were a lot of different types of restrictions applied to investment, especially the foreign investment which in turn discouraged investment in the country (cited Rugman and Banga cited by Asafo-Adjei, 2007). These restrictions were linked to admittance and institution, possession and control, and other operative actions (Asafo-Adjei, 2007 cited Rugman and Banga). However the liberation the country saw all these restrictions removed thus actively encouraging investment in the economy. The country now has no restriction on the type or extent of investment available to foreigners (Vickers, 2002).

3.4.1.4 Tax structure

The country has a highly established and regulated taxation regime. The tax regime in a country may affect investment positively or negatively. The tax regime is decided by the National Treasury and managed by the South African Revenue Service (SARS). The uncertainty of net profitability and project of an investor is impacted by a tax system that is not of good standard which in turn affects capital. This is encouraged by the transparent, over difficult or complexity of an application or rules. There would be Corruption and challenge of good governance essential objectives, if the assignment of extreme administrative decision of tax relief that are supposed to secure an attractive investment are left in the hands of officials. Thus it is encouraged that tax systems of host countries have their policy makers impose fair tax burden, preserves tax compliance and tax administration costs under control, and consequently attracting investment (Asafo-Adjei, 2007).

Tax incentives play the role of attracting investments in an economy on both foreign and domestic fronts. There are different types of tax incentives. Tax holidays, partially provide preferred rates, deductions, exemptions and may fall on one tax. They are the kinds of enticements that release tax burden entirely. They are allocated by policy makers as well as sub-national governments (Calitz, Wallace and Burrows, 2013).

Extracted from Calitz, Wallace and Burrows (2013), this section would look at a few tax incentives the country has:

- Tax holidays – An administration motivation package that gives an expense lessening or end taxes to organizations. However they are frequently utilized by governments as a part of enticing FDI in their country. The benefit is that the cost ratio is low. It is predominantly receptive to tax planning (i.e. avoidance schemes), including fictitious foreign-owned companies.
- Preferential Cooperate Income Tax – Is a lower corporate income tax rate. It is one of the mostly used form of the privileged tax treatment for small (and medium sized) business. The principles are intricate and exposed to control. Revenue equally from old and new operations gets to be qualified. It is more averse to be cost-effective than motivating to new investment considering the amount.
- Investment allowances – With this incentive firms benefit because of the income from previous operations which shields part of the revenue from tax with incentives earned

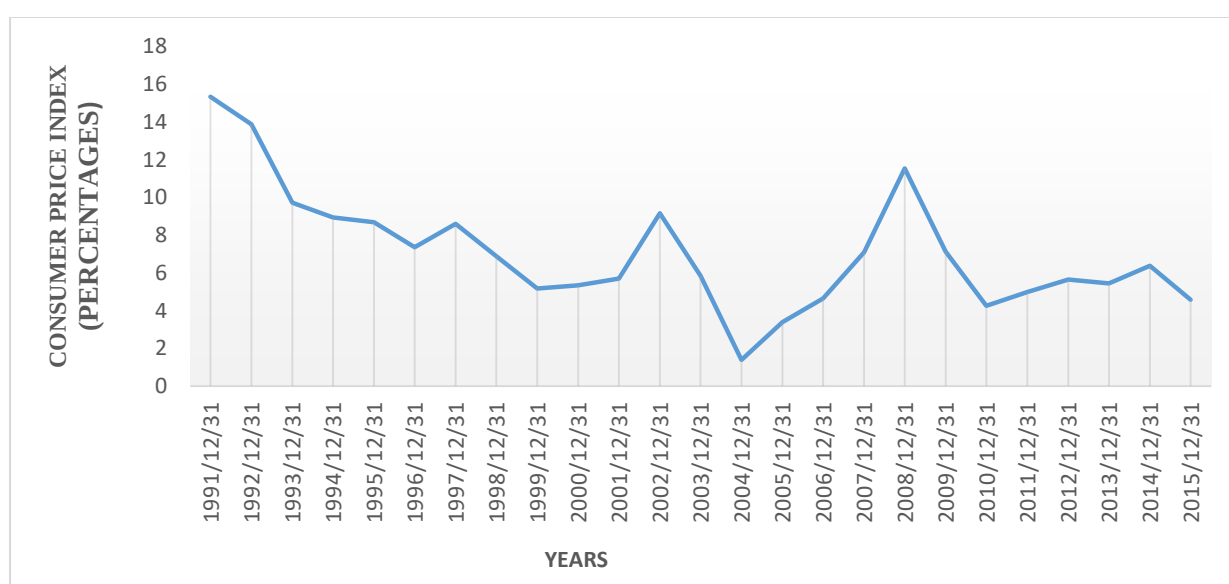
from new investment. Not all firms may benefit from this incentive, like the ones with low income or start-up firms until investment begins to earn taxable income.

- Investment tax credits – It involves using subsidiary costing to request profit for ineffective spending or cost (together with depreciation allowances) exceeding investment.
- Investment subsidies – It can be in the form of income tax relief and/or preferential tax rates on interest, dividends and capital gains.

3.5 Inflation

Inflation results in the loss of purchasing power. Thus rationally, difference in inflation rates between currencies should have an effect on the prices of their currencies (Zhang, 2009). Inflation is measured in South Africa using the Consumer Price Index (CPI). CPI compares the prices of basket of consumer goods and services with the price of a similar crate the prior year (Mokgola, 2015). Inflation in South Africa is decided by the goods and services produced domestically (Wakeford, 2006). Historically, South Africa's inflation rate was fixed to that of its main trading partners (Library of congress, 1997). Ricci (2006) wrote that over time South African inflation would be eventually be driven primarily by two factors; world inflation and domestic monetary policy. Inflation in a country may either be good or bad, however if a country experiences high inflation, economic performance is affected (Chicheke, 2009).

Figure 3.5 Consumer price index in South Africa (1991-2015)



Source: Data compiled by Quantec (self-made graph).

Inflation in South Africa indicated significant high levels during the 1970s and 1980s of which it entered double digits (Ricci, 2006). Then from 1980 till the early 1990s, the country's inflation was averaged to about 14 percent, regardless of the disinflation with the countries trading partners. Chicheke (2009) wrote that it was due to a weak monetary policy. The economy started seeing a decline in the inflation levels by 1993 where it had declined to below 10% (Akinboade, Siebrits and Niedermeier, 2004). In 1994 the decline was 9.1 percent, however in early 1995 it increased again due to pressure from new social spending, nonetheless declined to 8.7 percent by the end of the year. The lower rate of inflation resulted in part from a decline in food prices, the relative stability of the rand, and the lowering of import tariffs.

In 2002 there was high inflation level of 13.51 % which was attributed to exogenous factors such as the decline in the value of the rand during the second half of 2001. Also, the rise in the price of oil played a role as well as the increase in administered prices (Chicheke, 2009).

The years that came after observed inflation rate fluctuate. Until 2008 the country experienced inflation level elevated to 9.35, % the highest it has seen in five years. Akinboade, Siebrits and Niedermeier (2004) wrote that South Africa rarely entered moderate range, for the past four decades. Moderate range is defined as the persistent annual rates of price increases ranging between 15 and 30% (Dornbusch and Fischer cited by Akinboade, Siebrits and Niedermeier 2004).

3.5.1 Policy on Inflation

The South African monetary institution agreed on adopting the inflation targeting monetary policy in February in 2000 with the announcement of a three to six per cent target for 2002. The policy was established for a simple reason; to create a favourable environment to maintain an even low inflation (Kaseeram, 2012). Once the South African reserve bank agreed on adopting the policy, the decision about which consumer price index to target had to be made because to measure inflation in South Africa there are three methods to consider which are the headline Consumer Price Index, the Core Consumer Price Index and the Consumer Price Index excluding the mortgage interest from the consumer basket (Mokgola, 2015). According to Meyer (2002), for the measurement of inflation targeting the Central Banks consumer price inflation used, since consumer price index is the most applicable to the calculation of real income for households hence it is deemed suitable.

After the implementation of inflation targeting, the country experienced a lower inflation rates and interest rates. The Consumer inflation came in at under 5% from 2004 through 2006 before global prices pushed it up to 6.5% in 2007 but returned to below 6% in 2011 (IMF, 2007).

3.6 Interest rate

Real interest rate is nominal rate adjusted for expected inflation and is mostly calculated as the change between the nominal interest rate and the expected or actual inflation (Sibanda, 2012). Interest rates perform quite an important role, because they affect the developments in nominal and real sides of the economy; they also influence investments in a country (Zhang, 2011). Similarly, the importance of interest rates can be noted as it is the link by which money supplies are transferred to the real economy (Chicheke, 2009; Sibanda, 2012).

According to Obsfeld (1986), elevated interest rates create a wider spread between the domestic interest rate and the world interest rate, while a lower real interest rate, particularly in the context of political risk and instability, has the effect of reduces investment. However in an opposite view, Zhang (2011) wrote that interest rates have an influence on the financial account transactions and impact the currency demand of a country. When a country's interest rate increases, a greater return can be earned and financial investors worldwide would want to invest in this country. Thus when other macroeconomic factors are stable, that is if the level of the interest rate in South Africa is higher than the world average, the Rand will generally appreciate against the major currencies of the world. Nevertheless ever since the reserved bank took over management of the real interest rates in South Africa from the start of the decade, investors are finding it attractive to invest in the country (DTI, 2006).

3.6.1 Policy on interest Rate

Similar to the inflation rate, monetary policies are used in the management of the interest rate. The South African Reserve Rank (SARB) uses short-term interest rates and some quantity measure of monetary base.

The Keynesian setups, interest rates in the money market are a major determinant of spending and hence a major indicator of the condition of the economy. Therefore if there is economic slowdown, interest rates will raise thus limiting consumers' disposable income. Thus interest rates are a key mechanism by which Regulators control consumer spending too (Chicheke, 2009; Katona, 1975).

As a direct intervention mechanism in the economy by the Reserve Bank, its choice of interest rates affects the general level of spending in the economy. Interest rate is used as a tool to regulate inflation by raising its rate to discourage consumption (credits) or by lowering its rate to increase consumption. Whichever measure is applied may either result in inflation or may defeat the purpose of expanding the market capacity (Michie and Padayachee, 1998).

3.7 Summary

This chapter gave an overview the macroeconomic environment of South Africa, between the apartheid era and post-apartheid era. Firstly the chapter discussed the overview of the country. The country is one of the fastest growing economies, with a high-level free-market economy on the African continent thus making the country a very attractive destination for investment. The second section discussed the economic growth and shows trends from the apartheid era to post-apartheid era of which depicted a clear indication of improvement during post-apartheid era. The third section discussed the countries investment, the differentiation of FDI and Portfolio it also includes policies to attract investment in the country. Thirdly, trends in inflation were also reviewed followed by policies. Lastly, the chapter looked into interest rate and its policies.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter describes the research methodology followed in this study in detail. It presents the method and techniques that can be used to test if there is a long-run equilibrium relationship between the two variables, and whether volatility in exchange rate can affect foreign direct investment and domestic investment. The structure of this chapter is as follows: section 4.2 would be the model specification, where the variables would be described and the expected sign Section 4.3 summarises the data sources and analysis. Section 4.4 discusses the estimation techniques and procedure. In this section the stationary tests is also discussed. Then section 4.5 provides the diagnostic tests used for the study. Lastly Section 4.6 concludes the chapter.

4.2 Model Specification

The measure of exchange rate volatility has influence on investments, both domestic and foreign direct investment in South Africa. The model for FDI in this study adopts Ogunleye's (2009) model, Ogunleye (2009) used the GARCH model to investigate the impact of exchange rate volatility on foreign direct investment in Nigeria and South Africa. For domestic investment model, the study adopts Gomez's (2000) model, when she was investigating exchange rate volatility effects on domestic investment in Spain. For both their studies the models used is as follows:

$$FDI_t = (Ex_t, Ex_d, Vol_t, Dvol_t, R_t, Infr_t, K_t) \quad (4.2.1)$$

The model was generated using the GARCH methodology, where Equation 4.2.1; FDI is expressed as a function of (Ex) which represents changes in the levels of real exchange rate measured as the real effective exchange rate, Exd represents the standard deviation of the monthly real exchange rate, (Vol) is the real exchange rate volatility, Dvol is the demand volatility, (R) is the real interest rate, (Infr) is infrastructure represented by the total electricity provision the country and (K) represents the capital control dummy which takes the value one for the period of capital control and zero otherwise.

This present study shall refashion Oguleye's (2009) model. The explanatory variables that are included in this study's model are: the GDP, Inflation, interest rate, Trade openness, and corporate tax. The model will, therefore, be structured in its linear form as:

$$LFDI_t = \beta_0 + \beta_1 LExchv_t + \beta_2 LGDP_t + \beta_3 LINFR_t + \beta_4 LINTR_t + \beta_5 LOPEN_t + \beta_6 LCorpTX_t + \varepsilon_t \quad (4.2.2)$$

Where ε_t is a white noise error term and the L in the above model stands for natural logs.

Gomez (2000) Domestic Investment model as follows:

$$\Delta I_t = \alpha_0 + \alpha_1 \Delta GDP_t + \alpha_2 \Delta r_t + \alpha_3 VOL_t + \alpha_4 \Delta I_{t-1} + \varepsilon_t \quad (4.2.3)$$

Where I is the logarithm of investment at time t, GDP_t is the logarithm of gross domestic product, r_t is the logarithm of real interest rate, and VOL_t is the commented volatility measure. Some of the employed volatility measures were found to be I(0) while others seem I(1), so some of the regressions include the volatility measures in levels and others in differences. The residuals ε_t should present the standard properties.

This present study refashions Gomez's (2000) model. The explanatory variables that are included in this study's model are: the Exchange rate Volatility, GDP, Inflation, interest rate. The model will, therefore, be structured in its linear form as thus:

$$LDI_t = \beta_0 + \beta_1 LEXRV_t + \beta_2 LGDP_t + \beta_3 LINFR_t + \beta_4 LINTR_t + \beta_5 LOPEN_t + \beta_6 LPOLs_t + \varepsilon_t \quad (4.2.4)$$

4.2.1 Description of Variables and Expected Signs

LFDI is the natural logarithm of the foreign direct investment. It is an investment made to acquire lasting interest in enterprise operating outside the economy of the investor the size of this variable is a good indicator of the relative attractiveness of an economy to foreign investment. It is also a vehicle for the economic growth of developing countries. FDI within the context of this frame work refers to direct investment made by foreigners into South Africa's economy (Ohazulike, 2012). It is expected that foreign direct investment will be negatively associated with volatile exchange rate. According to Kyereboah-Coleman and Agyire-Tettey (2008), if exchange rate volatility on FDI is significantly negative, real exchange rate volatility (risk) tends to reduce FDI inflows into any country.

LDI is the natural logarithm of domestic investment. Domestic investment is defined as the investment that is being injected into the economy by the residents and/or by local institutions in the country (Cambridge University Press, 2016). Domestic investment can be in the form of the purchase of fixed property and inventory, all for the purpose of increasing domestic

production (Business Dictionary, 2016). It is expected that a negative relationship will be linked between the volatile exchange rate and domestic investment.

LEXRV is the natural logarithm of US/Rand Exchange rate volatility. The independent variable is exchange rate; it measures the cost of goods and services produced in South Africa relative to an equivalent basket of foreign produced goods and services (Mpofu, 2014). Exchange rate volatility is the risk associated with unexpected movements in the exchange rate (Ozturk, 2006). Volatility of a country's exchange rate can be caused by the volatility of nominal exchange rate or relative consumer price index or the volatility of both variables. Whatever the case, higher exchange rate volatility would mean that exchange rate can possibly move over a large set of values, while lower volatility would indicate that exchange rate changes steadily over a period of time (Yusoff & Sabit, 2015). The US dollar has been utilized as an influential currency in international transaction as well as close links between the South African and US economies (Mlambo, 2013). Therefore, it is expected that fluctuations in the exchange rate is expected to be negative to any type of investment.

LGDP is the natural logarithm of GDP. The independent variable GDP measures economic growth. GDP is the sum of the value added by all resident producers plus any product taxes (subsidies subtracted) not included in the valuation of output (World Development Indicators, cited by Mpofu, 2014). For the purposes of this study, the success of investment is measured against the effect that it has on the GDP growth rate of South Africa. According to Leong and Wickramanayake (2004), expected GDP outcome can either be positive or negative. It can be positive since an increase in the GDP of a host country may increase investment by increasing expected returns or it may decrease inflows as South Africans repurchase domestic securities from foreigners due to higher GDP.

LINFR is the natural logarithm of inflation rate. Inflation rate is a continuous and considerable rise in prices in general (Mohr et al., 2008). Inflation rate is a cause of exchange rate volatility, a higher inflation rate in the country will result in depreciation of the country's currency while a lower inflation rate in the country will result in appreciation of the currency (Chaudhary and Goel, 2013). Due to that reason, it was added as an independent variable when measuring for volatility in exchange rate. It is also an independent variable in both investment models, because according to Kanu and Ozurumba (2014), inflation makes investment uncertain, due to its increased price variability which causes cautious investment

strategies resulting in lower levels of investment. It is expected that inflation is negative, because high inflation has negative affect on all types of investment.

LINTR is the natural logarithm of interest rate. Interest rate is the percentage charged by the lender to the borrower for the use of money or assets (Mohr et al., 2008). The official interest rate is the repo rate. This is the rate at which central banks lend or discount eligible paper for deposit money banks, typically shown on an end-of-period basis. A higher interest rate in a country attracts foreign investors which in turn escalate the value of the domestic currency (Leong and Wickramanayake, 2004). It was also used as a variance regressor in the measurement of exchange rate volatility and also as an independent variable in the investment models. Therefore, it is expected that interest rate is positive because investors seek to maximise their wealth from higher interest rates (Mpofu, 2014). However, domestic investment is expected to be negative because a high interest rate discourages borrowing and in turn reduces domestic investment.

LOPEN is the natural logarithm of openness. Openness of a country is the ratio of net exports to the GDP of the country shown by the degree to which investors can move large sums of money in and out of a country (Mazenda, 2012). Going by Mazenda (2012), the study uses exports as a proxy for openness. Exports are the total goods a country produces locally and sells outside the country in order to receive foreign currency (Mpofu, 2014). The assumption is that South Africa received insufficient FDI during the apartheid era as the country was not so opened to the rest of the world due to the number of capital controls. With the advent of democracy, capital controls were relaxed, hence FDI was encouraged. Export is expected for the openness variable as positive because foreign investment is encouraged in turn beneficial to economic growth (IMF, 2010).

LTAX is the natural logarithm of Tax. Taxation becomes relevant when a company has to decide to either invest abroad or at home (Yanin, 2010). This study uses the corporate tax rate. Tax is an important factor in decisions making on where to invest. Investment increases in countries when the tax rate are not burdensome, thus according Djankov et al. (2010), effective corporate tax rates have a large adverse impact on aggregate investment and FDI. Tax is expected to have a negative impact on FDI because in accordance with Oniyewu and Shareshta (2015), high levels of taxation would discourage FDI whilst low levels of taxes would boost investment.

LPOL is the natural logarithm of political stability. Political instability is defined as the propensity of a change in the executive, either by constitutional means or unconstitutional means (Alesina et al. 1992). Political instability increases inflation (Aisen and Veiga, 2006), thus it was included to the measurement of exchange rate volatility as a variance regressor. A stable political country attracts more investment than an unstable one. Therefore as long as the foreign company is confident of being able to work profitably without unnecessary risk to its capital and personnel, it will maintain investment (Demirhan and Masca, 2008). According to Alesina and Parotic (1996), political instability creates uncertain in an environment increasing risk resulting in decrease of investment. In this study it is measured as political stability index (%) (The index of Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood that the government of South Africa will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism). Political stability is expected to generate a positive relationship with Domestic investment.

4.3 Data Sources

The data for the study was obtained from secondary sources, which are the South African Reserve Bank (SARB), World Bank website and Quantec (website) which publish official statistics hence the validity and reliability of the data is assumed from the data collection processes and also for their consistent purposes. The data frequency selected was a yearly data. The study employed South African annual data for the period 1980 – 2015. The period is chosen because it gives a clear trend of what happened before and after the apartheid era. In this research, the E-Views 9 software was used for general statistical analysis and econometric analysis.

4.3.1 Log change

All variables used in this study were changed to log form. According to Gujarati (2004), such a transformation reduces heteroscedasticity in the data. The log form is the reducing of scales in which the variables are measured allowing results to be translated as elasticity values

4.4 Estimation Techniques and Procedure

For the investigation of potential relationship between exchange rates volatility and foreign direct investment and domestic investment in South Africa, a multivariate approach was used. A fitting model for a multivariate analysis is the Vector Autoregressive Model (VAR). The Vector Autoregressive Model (VAR) provides the basis for the analysis of causal relationship

between the studies variables (Maepa, 2015). Concurring, Brooks (2002) wrote that VAR is the beginning point for different analysis, including the co-integration test, Granger causality test and the impulse response analysis test.

4.4.1. ARCH and GARCH

There are two main methods which are the standard deviation and the use of ARCH and GARCH techniques (Ogunleye, 2009). The ARCH and GARCH models are popular methods in the finance literature as vehicles to model volatility (Engle, 1982; Bollerslev, 1986). The ARCH was introduced by Engle (1982) and later modified by Bollerslev (1986) as the Generalised Autoregressive Conditional Heteroscedasticity (GARCH).

Ogunleye (2009) stated that the significant reactions of the distinctive variations of standard deviation as a measure of exchange rate volatility are that they disregard the stochastic process producing the rates of exchange. Engle (1982) mentioned that with using the standard deviation for measuring volatility causes, relevant information on the random process generating the exchange rate should be ignored. Therefore the results of the estimation may be influenced by the method of measurement used in the process of measuring the exchange rate volatility (McKenzie, 1999).

However for this study the GARCH methods was used, however before the GARCH estimation, the testing for an ARCH would be done to check if there is heteroscedasticity in the residuals of the exchange rate. Melku (2012) said that the test assumes the variance of current error term to be a function of the actual size of the previous time periods error term. The normal procedure of testing for ARCH effect is to regress exchange rate on the q lag of its own, collect the square of the error term and regress them on the lag of their own. The R^2 obtained from the second regression multiplied by the number of observations follows a chi square". Thus if the test statistics is greater than the critical value from the chi square distribution, the null hypothesis of no ARCH effects is rejected and we can continue on the GARCH estimation (Bollerslev, 1986).

Yang (2011) explained in his study that the GARCH estimation involves a joint estimation of the mean and conditional variance equation; these are commonly used to capture the volatility clusters. The general GARCH model is based on the assumption that the forecast of the conditional variance is dependent upon its previous first lag.

$$R_t = \mu + \epsilon_t$$

$\epsilon_t = \sigma_t Z_t$ where: $Z_t \sim f(0, 1)$ white noise

$$\sigma_t^2 = \omega + \alpha \epsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

Where μ is a constant parameter. σ_t^2 Denotes the conditional variance of returns.

ϵ_t is the innovation process while $f(0,1)$ is a density function with a mean of zero and a unit variance. If we consider the GARCH model under different distribution, Z_t can either be normal, t or GED distributed. Moreover, ω , α and β are non-negative parameter.

The sum of $\alpha + \beta$ measures the persistence of conditional variance to shocks. If $\alpha + \beta < 1$, the conditional variance demonstrates the mean reversion. This means after one shock it will eventually return to its unconditional mean and ensures the positive of conditional variance and stationarity as well.

4.4.2 Vector Autoregressive Model (VAR)

According to Zivot (2014), the vector auto regression (VAR) model is highly effective, flexible, and easy to use in the analysis of multivariate time series. The VAR model has proven to be especially useful for describing the dynamic behaviour of economic and financial time series and or forecasting. The VAR model which handles a set of variables equally simultaneously (Sims, 1980). Brooks (2014) wrote that VAR is used for describing the dynamic behaviour of economic and financial time series, as well as for forecasting. It also provides forecasts for multivariate time series models and for theory-focussed equation models. According to Dolado *et al.* (1999), should the time series be nonstationary, then the VAR model needs to be made stationary in order to allow for consistency amongst the estimation of the relationships that are being tested for among the series.

4.4.3 Stationarity testing

Prior to the estimating of the VAR model, it is crucial to determine if the time series is stationary or non-stationary. Stationary tests occur to evaluate if the underlying stochastic process of the time series can be assumed to be invariant over time. In a case where the mean and variance of a time series are constant over time, then the time series is said to be stationary (Mlambo, 2013). Bethea and Rhinehart (1991) explained that if the time series is considered to be without stationarity, then it can be assumed that there is a chance of entering into a spurious regression analysis. A spurious regression analysis refers to an analysis that yields no direct causal relationship between two variables, but it may be wrongly summarised

that they do, which may be due to pure coincidence, or perhaps due to the presence of a third and unforeseen factor.

- **Augmented Dickey-Fuller (ADF) test**

Saunders *et al.* (2001) said that the Unit root analysis was firstly used to test stationary of time series. For that reason, the Augmented Dickey Fuller (ADF) test was implemented to determine whether the series has a unit root. If the ADF test fails to reject the test in levels but rejects the test in first differences, then the series contains one unit root and is of integrated order one $I(1)$. If the test fails to reject the test in levels and first differences but rejects the test in second differences, then the series contains two unit roots and is of integrated order two $I(2)$. For the ADF test, one must specify the number of lagged first difference terms to add in the test regression. The ADF test also determines whether the data series are drifting (i.e. whether they are integrated). The main objective of this test is to discover whether the data series need to be differentiated, and how many times this must be done in order to induce their stationary.

The ADF model is used to test the following hypothesis:

H_0 = (Time series is non-stationary)

H_1 = (Time series is stationary)

The calculated value of ADF is then compared with the critical value at a conventional level of significance. If the calculated value is greater than the critical value, reject the null hypothesis that the series has a unit root, therefore confirming that the series are stationary.

- **Phillips-Perron (PP)**

The Philip – perron test is a more thorough unit root non stationarity. The PP uses a non-parametric statistical method to take care of the serial correlation in the error term without adding lagged difference term (Gujarati 2003). The PP test and the ADF test are quite similar; however the PP test incorporates an automatic correction to the DF procedure to allow for auto correlated residuals. The PP test and the ADF test have the same asymptotic distribution and often yield the same result (Brooks, 2008).

The PP model is used to test the following hypothesis: $H_0 = y_t \sim I(1)$

$H_1 = y_t \sim I(0)$

The calculated value of PP is then compared with the critical value at a certain significance level. If the calculated value is greater than the critical value, reject the null hypothesis that the series have a unit root, therefore confirming that the series are stationary.

4.4.4 Cointegration Tests

According to Mpofu (2014), cointegration tests helps to determine if there is a long-term relationship between the variables of interest in the study. Evidence of cointegration is an indication that variables under study have a common behaviour in terms of their long-term fluctuations. To avoid false rejection or acceptance of estimated results and to have standard normal error terms that do not suffer from non-stationarity, it is important to empirically select the lag length to incorporate in the vector auto regression (VAR) before testing for cointegration.

Lag length selection is crucial because it affects the power of rejection hypothesis. The lag length will be chosen based on the Aikake's information criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn criterion (HQC).

According to Liew (cited by Mpofu, 2014) the AIC is the criterion which has been commonly used in most studies as it is trusted that the criterion is able to pick up the correct lag length at least half of the time in small samples and its performance increases substantially as sample size increases.

Mpofu (2014) further on explained that after selecting the correct lag length, cointegration tests will be carried out. Thus there number of cointegration test methods can be employed to establish the existence of cointegration between variables and these include the Engle Granger, the Johansen cointegration tests and the Auto-Regressive Distributed Lag (ARDL) approach.

For this study the Johansen cointegration test will be used instead of the simple Engle and Granger approach and the ARDL because of its advantages these methods. Jung and Seldon (1995) acknowledged that the Johansen co integration test is more effective as there won't be a necessity of knowledge of the co-integration vectors, in cases when they are unknown. This test does not require all variables to be in the same order of integration, and hence this test is much more suitable. They also mention the fact that this method of investigating the existence of co-integrating relationships has become standard in the econometrics literature

because of its superiority over other alternatives. The Johansen (1988) methodology utilizes Vector Auto Regression (VAR) to test the co-integration.

According to Johansen (1988), the multivariate co-integrating is derived from a VAR model as follows:

Considering unrestricted VAR model:

$$Z_t = \sum_{i=1}^k A_i Z_{t-i} + e_t \quad (4.4.3.1)$$

$$z_t = \begin{bmatrix} x_{1t} \\ x_{2t} \\ \vdots \\ x_{nt} \end{bmatrix} \text{ is column vector of variables } X_{1t} \text{ to } X_{nt}; \text{ and,}$$

e_t = a column vector of random errors which are usually expected to be contemporaneously correlated but not auto correlated. Suppose that all variables are cointegrated in order, the VAR model in equation 1 can be represented as follows:

$$\Delta Z_t = \Pi Z_{t-k} + \sum_{i=1}^{k-1} (i-1) \Gamma_i \Delta Z_{t-i} + e_t, \text{ for } k \geq 2 \quad (4.4.3.2)$$

Where $\Pi = -(I - A_1 - A_2 - \dots - A_k)$; and $\Gamma = -(A_{i+1} + A_{i+2} + \dots + A_k)$, $i = 1 \dots k-1$

Johansen & Juselius (1990) wrote the matrix Π can be expressed as a product of two matrices:

$$\Pi = \alpha \beta'$$

Where α and β' are both the same since Π is a square matrix

The matrix β' gives the co-integrating vectors (a matrix of long run coefficients), while α stand for the adjustment of parameters that shows the level of speed with which the system responds to last period's deviations from the equilibrium (Brooks, 2014). Therefore, Johansen co-integration is based on analysis of the Π matrix. The test for co-integration is conducted by looking at the rank (r) of the Π matrix with the use of the trace test and the maximum eigenvalue test.

The trace test tests the hypothesis that there are at most r co-integrating vectors and is as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \lambda_i)$$

λ_{trace} is a joint test where:

H_0 : the number of cointegration vectors $\leq r$ and

H_1 : the number of cointegration $> r$.

The maximum eigenvalue test tests the hypothesis that there is $r+1$ co-integrating vectors against the hypothesis that there is r co-integrating vectors and is as follows:

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1})$$

Where:

r is the number of co-integrating vectors under the null hypothesis, $\hat{\lambda}$ is the estimated value for i th ordered eigenvalue from the Π matrix and T is the number of usable observations. $\lambda_{\max}$ conducts a separate test on each eigenvalue in sequence as follows:

$H_0: r = 0$ versus $H_1: 0 < r \leq n$

$H_0: r = 1$ versus $H_1: 1 < r \leq n$

$H_0: r = 2$ versus $H_1: 2 < r \leq n$

$H_0: r = n-1$ versus $H_1: r = n$

The first test involves a H_0 of non-co-integrating vectors (corresponding to Π having zero rank). If the H_0 is not rejected, it would indicate that there are no co-integrating vectors and the cointegration test would be completed. Contrary, if the H_0 for $r = 0$ is rejected; the H_0 for $r = 1$ will be tested and so on. Hence, the value of r is repeatedly increased until the H_0 is no longer rejected. Since there are only two variables in each country's equation, the results are expected to have at most one co-integrating equation. Nevertheless, if the variables are found to be co-integrated then the following vector error correction model (VECM) is used to capture the error correction.

4.4.5 Vector Error Correction Model (VECM)

If cointegration is established for time series that is non-stationary, VECM will be employed to analyse the joint behaviour of the series in the dynamic system. The vector error correction model (VECM) is a statistical model that is prepared to reintroduce the information lost in the differencing process, thus allowing for the long-run equilibrium and developments of the endogenous variables to come together to their cointegrating relationships, whilst making room and availing itself for short-run adjustment dynamics (Ang and McKibbin, 2007; Brooks, 2002).

According to Aziakpono (2006) for VECM the short-term dynamics of the variables in the system are partial to the deviation from equilibrium as shown in the error correction model or equilibrium correction model below: $\Delta y_t = \beta_1 \Delta x_t + \beta_2 (y_{t-1} - yx_{t-1}) + \mu_t$

In the above model, the error correction term is given by $y_{t-1} - yx_{t-1}$. The coefficient x_{t-1} on of one in this term recommends a proportional long run relationship between y and x . The model specifies that y is assumed to change between $t-1$ and t as a result of changes in the values of the explanatory variables x between $t-1$ and t . The change in y would explain the part correction to any disequilibrium at time t . consequently y defines the long-run relationship between x and y . while β_1 describes the speed of modification back to

equilibrium. Thus this suggest that it is measures the proportion of the last period's equilibrium error that is corrected.

4.5 Diagnostic Test

Diagnostic tests are is an essential function of econometric, according to Takaendesa (2006); Zeileis & Hothorn, (2002), the diagnostic test measures the stochastic properties of a model used in a study, such as residual autocorrelation and heteroskedasticity. With regards to this study the only diagnostic test that would be analysed are the autocorrelation and heteroscedasticity tests.

4.5.1 Autocorrelation Test

Autocorrelation can be defined as relation between series of observations ordered in time Gujarati (2003). Autocorrelation is said to occur when there is an accumulation of error terms that perfectly correlated over different periods of time. An event like this transpires when the error term that is related to the observations over a given period of time, in time series, are carried over into periods that are yet to be experienced (Maepa, 2015). The concerns that may arise in autocorrelation are that the OLS remains unbiased, nevertheless they become inefficient and its standardized errors are estimated in the wrong way (Chicheke, 2009).

4.5.2 Heteroscedasticity Test

According to Gujarati (2003) heteroskedasticity arises if different error terms are not with identical variances, so that the diagonal elements of the covariance matrix are not identical. Thus heteroskedasticity can be referred to as an econometric test that is based on the assumption that the variance of an error term is constantly a condition termed homoscedasticity. If there is no constant variance in the error terms then these error terms are said to be heteroscedasticity (Sibanda, 2012). According to Gujarati (2003) if the normal testing process are taking without the heteroskedasticity test whatever result or interpretations that are made form that result would be misinforming.

4.6 Impulse response analysis and Variance decomposition

4.6.1 Impulse response

Impulse response analysis is the investigation of a variables impact on others, this test is quite important in empirical causal analysis and policy effectiveness analysis (Lin, 2006). Gunes (2007) explains that a singular variable may befallen with a shock thus disturbing this variable, in turn it captures and generate different variations not only infecting itself but also in the other variables in the model, hence the reason the impulse response analysis is conducted. In econometrics, the impulse response analysis is generally applied to the vector

error correction model provided that the shocks associated with the vector error correction model fades away gradually over time.

4.6.2 Variance decomposition

Variance decomposition divides variation endogenous variable into components shocks to the VECM (Mpofu 2014). Conferring, Seymen (2008) wrote variance decomposition is an econometric time-series analysis method that is used in the estimation of the vector autoregressive model (VAR), it's a tool used as a measure of the contribution that each shock contributes to the forecast error variance. The Variance decomposition analysis presents information about the relative importance of each random innovation in affecting the variables in the VECM. It can be simply put as the variance decomposition analysis determines how much of a step-ahead forecast error variance of a given variable is explained by innovations to each explanatory variable for $s = 1, 2 \dots$ (Brooks, 2014).

4.7 Granger causality model

According to Weiner the Granger causality model is the assumption that if the prediction of one time series is improved by incorporating the knowledge and experiences of a second time series then, then the second time series will have a causal influence on the first time series (Maepa, 2015). Essentially the Granger causality model is used to determine whether one time series can be used in the predicting of another series (Maepa, 2015). If a signal X_1 "Granger causes" a signal X_2 , then it can be said that the previous values of X_1 should have information that can help predict the possible behaviour of X_2 above and beyond the information contained in the past values of X_2 alone. The mathematical formulation of the model is primarily based on linear regression modelling of stochastic processes (Maepa, 2015).

4.8 Conclusion

This chapter has discussed the methodological framework of the study such as the model specifications, data sources and definition of variables. The chapter also looks at the analytical framework in which the impact of exchange rate volatility on domestic investment and FDI will be investigated. The appropriate method was selected for the analysis of this study. The Vector Autoregressive Model (VAR) was selected as the approach for this analysis as this model is the starting point for the conduct of different analyses. The subsection also included the definitions of the unit root test, co-integration test, the Vector Error Correction Model (VECM), diagnostic tests, impulse response analysis and the variance

decomposition of forecast errors and finally Granger causality were employed for the analysis of Exchange rate volatility effect on FDI and DI in South Africa from 1980 to 2015. The subsequent chapter runs the model specified in this chapter using the econometric package E-view 9.5.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1. Introduction

Increasing discussions have been taking place over the years on the relationship between exchange rates and investments, although it's resulted in conflicting views which is quite logical since there are different types of investment. The subject of a significant model, used in analysing the relationship between exchange rate volatility and investment is also scrutinised, as the model can affect the results. This chapter's main purpose is to outline, analyses and interprets result between exchange rate volatility's effect on FDI and DI in South Africa. The study incorporates yearly data stretching from the year 1980 to the year 2015. The data is obtained from South African Reserve Bank (SARB), World Bank, and Quantec website. The entire chapter is divided into sections; first section is the introduction, second section is the Volatility measurement, third section the graphical analysis is presented first, the descriptive analysis between the variables, followed by stationarity testing. The third section is co-integration tests, short-run relationship analysis is the last analysis conducted for the variables, and the results includes the Vector Error Correction Model (VECM) test, the diagnostic tests which includes the autocorrelation tests and the white heteroscedasticity test, the impulse response analysis and the variance decomposition of the variables follows subsequently. The final section of this chapter provides the discussion of the results obtained.

5.2 Volatility Measure

This study employs the ARCH and GARCH models established by Engel (1982) and Bollerslev (1986). Exchange rates have been known to best follow a GARCH process (cited by Kyereboah-Coleman and Agyire-Tettey, 2008). For this study we would use the GARCH (1.1).

Thus for the calculation of exchange rate volatility, the study will be adopting Kyereboah-Coleman and Agyire-Tettey (2008). They measured volatility as follows:

$$\ln RER_t = \varphi + \delta \ln RER_{t-1} + e_t$$

Where: $e_t \approx N(0, h_t)$, and:

$$h_t = \varphi + \delta e_{t-1}^2 + \gamma h_{t-1} + \mu_t$$

The conditional variance h_t is a function of three terms:

- (1) The mean φ
- (2) Information about previous volatility measured as the lag of the squared residual from the mean equation δe^2_{t-1} (ARCH term); and
- (3) The previous forecast error variance, γh_{t-1} (which is the GARCH term).

The Estimation of real exchange rate volatility (dependent variable: real exchange rate; method: ML-ARCH). The GARCH results indicates internal shock only but reality is there are external shocks too that explain exchange rate volatility in a country. In that regard the analysis would include variance repressors.

Therefore this study identified three contributors of exchange rate volatility namely inflation, GDP and Interest rates of which is introduced into the model. This may help in determining factors accountable for exchange rate volatility in South Africa.

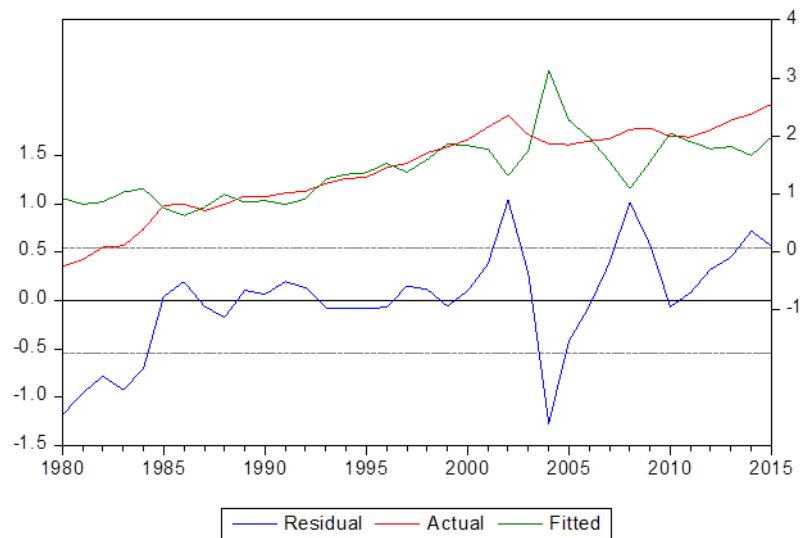
*Note Exchange rate and other variables present for this section was tested for stationary (find in table 5.1)

5.2.1 Mean Equation

Table 5.1 exchange rate mean equation

Dependent Variable : Log_exchange				
Method : least squares				
Samples: 1980 2015				
Include Observations :36				
Variables	Co – efficient	Std. Error	T-statistics	Prob.
C	3.450652	0.361757	9.538581	0.0000
Log_inf	-0.963960	0.166222	-5.799231	0.0000

Figure 5.1 Graphical representation of exchange rate mean



Results

From figure 1 a graph was fashioned as seen in figure 2 which shows the mean equation, the mean equation depicts fluctuations in the residuals of exchange rate. From 1985 to round about 1989 show small volatility, however more evidently is the fluctuation from the year 1999 to 2015.

Thus the study may proceed to introduce the GARCH and ARCH model, due to the confirmation of fluctuation in the residuals.

5.2.2 GARCH (1.1)

Figure 5.2 Volatility of Exchange rate

Dependent Variable: LOG_EXCH Method: ML ARCH - Generalized error distribution (GED) (BFGS / Marquardt steps) Date: 11/08/16 Time: 20:06 Sample: 1980 2015 Included observations: 36 Failure to improve likelihood (non-zero gradients) after 60 iterations Coefficient covariance computed using outer product of gradients Presample variance: backcast (parameter = 0.7) GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) + C(6)*LOG_POLS + C(7)*LOG_RINTR				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	3.006364	0.243583	12.34224	0.0000
LOG_INFPCP	-0.793498	0.088545	-8.961490	0.0000
Variance Equation				
C	0.098542	0.081085	1.215294	0.2243
RESID(-1)^2	1.017429	0.441497	2.304496	0.0212
GARCH(-1)	0.348621	0.131338	2.654392	0.0079
LOG_POLS	-0.029772	0.020978	-1.419212	0.1558
LOG_RINTR	0.012367	0.006424	1.924915	0.0542
GED PARAMETER	2.315430	1.465771	1.579667	0.1142
R-squared	0.486859	Mean dependent var	1.428143	
Adjusted R-squared	0.471767	S.D. dependent var	0.775527	
S.E. of regression	0.563650	Akaike info criterion	1.214669	
Sum squared resid	10.80185	Schwarz criterion	1.566563	
Log likelihood	-13.86405	Hannan-Quinn criter.	1.337490	
Durbin-Watson stat	0.673707			

Result

The GARCH used different distributions however the Generalized Error Distribution GARCH showed the best result thus this study choose it for generating the exchange rate Volatility. The result indicates that both probability values of the ARCH term and the GARCH term **0.0212 and 0.0079** respectively indicate significance because the p- value is $\leq$ **than 5** percent meaning they contribute to the volatility of the exchange rate. Inflation, political stability and interest rate displays a P-value of 0.00, 0.16 and 0.05 indicate that apart from political stability the other which is lesser than 5 percent confirms their contribution to exchange rate volatility in the country.

Finally according to Yinusa (2004) how to determine if a variable is volatile the decision rule as seen below:

If $\alpha + \beta < 1$ No volatility

If $\alpha + \beta \rightarrow 1$ There is Volatility

If $\alpha + \beta > 1$ this is the case of overshooting, meaning an outrageous level of volatility

Note: α = ARCH term/coefficient, while β = GARCH term/coefficient. Therefore the GARCH (1.1) shows an ARCH term of 0.91 and a GARCH term of 0.37 the summation of the ARCH and GARCH coefficient equals 1.37. Therefore since $\alpha + \beta > 1$, ($1.37 > 1$), we can conclude that there is a case of overshooting volatility.

The study generated an exchange rate volatility variable series based on the results from above.

5.2.3 Diagnostic Test

According to Sibanda (2012), diagnostic tests are to validate the parameter estimation outcome of the estimated model. Therefore in order to see if this model is valid it would be going through this test 1; autocorrelation test in order to see if the test has a serial correlation, 2; the ARCH test to check if the model has no Arch effect and finally the normality test to check if the residuals are normally distributed.

Table 5.2 exchange rate volatility Diagnostic Test

Test	H0	p-value	Conclusion
Normality Test	Residuals are normally distributed	0.4509	Errors are normally distributed
Serial Correlation Tests	No presence of serial correlation.	0.652 (lag 1)	No autocorrelation
Heteroscedasticity test	The residuals are homoscedastic	0.7942	No Heteroscedasticity

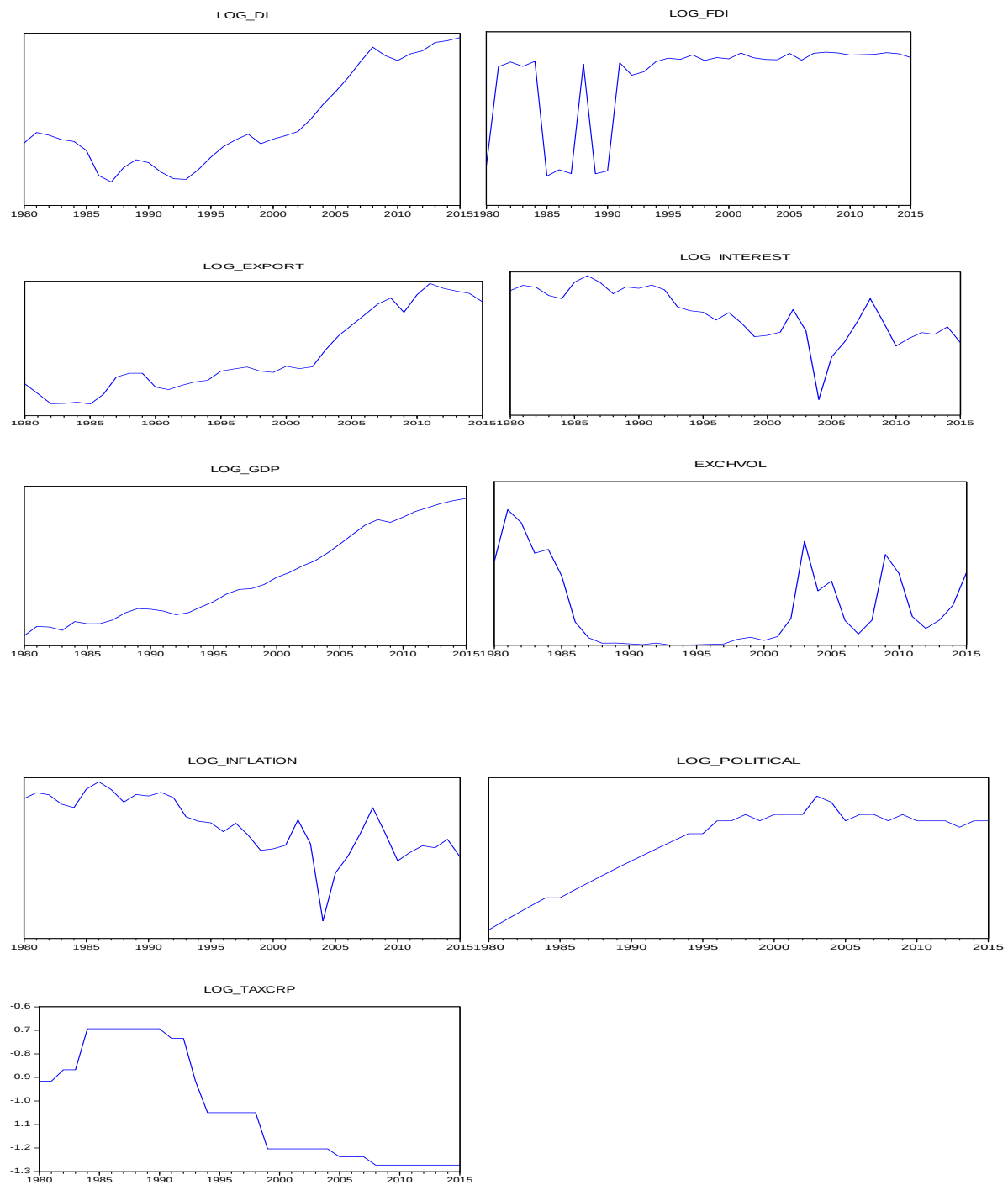
- The results indicated normality test the H0 = residuals are normally distributed and the H1= residuals are not normally distributed. Thus from figure 5 the Probability value is 45 percent which is greater than 5 percent thus indicating no ARCH effect in the model, meaning we accept the H0 hypothesis and reject the H1 hypothesis
- Serial Correlation at lag 1 it measured 0.652 which is greater than 0.005 indicating there is no autocorrelation, hence we accept the H0 hypothesis.
- The ARCH test: The H0 = there is no ARCH effect and the H1= there is ARCH effect. Thus the result shows the Probability chi- square value is 67 percent which is greater than 5 percent thus indicating no ARCH effect in the model, meaning we accept the H0 hypothesis and reject the H1 hypothesis.

5.3. Unit Root Test

5.3.1 Graphical Plots of the Variables

The variables were plotted at both level series and first difference series. The results are reported in graph 5.2 and 5.3.

Figure 5.3 Graphical Representations of the Variables (at level)



Graphical Plots at Level in the graph above shows that all the variables trend. This confirms that the time series at level are not stationary. The time series were therefore plotted using the first difference series and the results are reported in Figure 5.3.

Figure 5.4 Graphical Representations of the Variables (at first differencing)



Graph 5.3 shows that the time series are stationary after first differencing. The next step is analysing the time series using the formal tests, the ADF results are reported in graph 5.3.

5.3.2 Testing For Stationarity

Stationarity is fundamental when doing time series, in econometrics. However the graphical representations of the variables were done before hand, which was very beneficial for visualising the information.

The unit root test is done using the Augmented Dickey Fuller (ADF) test.

Table 5.3 Unit Root/ Stationarity Tests: ADF Test

	ADF Test (Intercept)		ADF (Trend and intercept)	
Variables	At Level	At first diff	At Level	At first diff
FDI	-1.7130	-4.3593	-2.3883	-4.4464
P- Value	0.4148	0.0020	0.3777	0.0079
C.V 1%	-3.6702	-3.6999	-4.2967	-4.3393
C.V 5%	-2.9640	-2.9763	-3.5684	-3.5875
DI	-0.1961	-3.3190	-2.8331	-3.7406
P- Value	0.9297	0.0218	0.1960	0.0329
C.V 1%	-3.6394	-3.6394	-4.2529	-4.2529
C.V 5%	-2.9511	-2.9511	-3.5485	-3.5485
GDP	1.047103	-4.3625	-2.3858	-4.7815
P- Value	0.9962	0.0015	0.3799	0.0027
C.V 1%	-3.6394	-3.6394	-4.2529	-4.2529
C.V 5%	-2.9511	-2.9511	-3.5485	-3.5485
Inflation Rate	-2.0836	-5.6974	-3.3733	-5.5816
P- Value	0.2521	0.0000	0.0715	0.0004
C.V 1%	-3.6329	-3.6617	-4.2436	-4.2846
C.V 5%	-2.9484	-2.9604	-3.5443	-3.5629
Interest Rate	-2.0836	-5.6974	-3.3733	-5.5816
P- Value	0.2521	0.0000	0.0715	0.0004
C.V 1%	3.6329	-3.6617	-4.2436	-4.2846

C.V 5%	-2.9484	-2.9604	-3.5443	-3.5629
Corp tax	-0.4098	-4.6626	-2.1316	-4.6311
P- Value	0.8966	0.0007	0.5111	0.0039
C.V 1%	-3.6329	-3.6394	-4.2436	-4.2529
C.V 5%	-2.9484	-2.9511	-3.5443	-3.5485
Export rate	-0.0914	-4.2244	-2.4730	-4.0707
P- Value	0.9427	0.0022	0.3386	0.0155
C.V 1%	-3.6329	-3.6394	-4.2436	-4.2529
C.V 5%	-2.9484	-2.9511	-3.5443	-3.5485
Exchange Rate	-1.9322	-4.3158	-2.7845	-4.3672
P- Value	0.3143	0.0017	0.2123	0.0076
C.V 1%	-3.6329	-3.6394	-4.2529	-4.2529
C.V 5%	-2.9484	-2.9511	-3.5485	-3.5485
ExVol	-2.5022	-7.3724	-2.3971	-7.4825
P- Value	0.1236	0.0000	0.3746	0.0000
C.V 1%	-3.6329	-3.6394	-4.2436	-4.2529
C.V 5%	-2.9484	-2.9511	-3.5443	-3.5485
Pols	-3.1838	-5.8367	-0.4846	-6.1748
P- Value	0.0295	0.0000	0.9793	0.0001
C.V 1%	-3.6329	-3.6394	-4.2627	-4.2627
C.V 5%	-2.9484	-2.9511	-3.5530	-3.5530

CV – Critical Value

Table 5.3 illustrates time series used in the model shows non-stationary. Suggesting the variables has no steady mean, steady variance and a steady co-variance at level. Thus the time series was tested for unit root at first difference and results indicated, the variables are stationary at 5% level and 1% level. This suggests that the series have a constant mean, constant variance and a constant covariance at their first difference series. This is consistent with macroeconomic data. This confirms the use of the Johansen Cointegration test which requires that the variables should be integrated of order one, I (1).

5.4 Johansen Co-Integration Test

5.4.1 Lag Selection Criteria

With the johansen co- integration it is necessary for a lag order to be select. The lag directs deterministic trend assumption of the VAR.

Figure 5.5 (a) Foreign Direct Investment Model lag length criteria

VAR Lag Order Selection Criteria Endogenous variables: LOG_FDIDGDP LOG_EXCHVOL LOG_GDPGRW LOG_INFPCP LOG_RINTR L... Exogenous variables: C Date: 11/21/16 Time: 13:32 Sample: 1980 2015 Included observations: 34						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-101.6693	NA	1.41e-06	6.392312	6.706563	6.499480
1	30.65553	202.3792*	1.12e-08*	1.490851	4.004857*	2.348199*
2	83.00709	58.51057	1.36e-08	1.293701*	6.007461	2.901228

* indicates lag order selected by the criterion
 LR: sequential 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

The results of the lag length selection criterion for the Domestic investment model shown by table 5.5 (a) can be seen that the selected lag is 1 optimal lag, which was selected by, most of the test. The study choose lag 1

Figure 5.5 (b) Domestic Investment Model lag length criteria

VAR Lag Order Selection Criteria
 Endogenous variables: LOG_DIGRW LOG_EXCHVOL LOG_GDPGRW LOG_RINTR LOG_INFPCP LO...
 Exogenous variables: C
 Date: 11/21/16 Time: 13:42
 Sample: 1980 2015
 Included observations: 34

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-107.3136	NA	1.96e-06	6.724331	7.038581	6.831499
1	39.73761	224.9019*	6.54e-09*	0.956611*	3.470617*	1.813959*
2	87.82478	53.74449	1.02e-08	1.010307	5.724067	2.617834

* indicates lag order selected by the criterion
 LR: sequential 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

The results of the lag length selection criterion for the Domestic investment model shown by table 5.4 (b) can be seen that the selected lag is 1 optimal lag, which was selected by, most of the test. The study choose lag 1.

5.4.2 Johansen Cointegration Rank Test and Max-Eigen for FDI and DI

Figure 5.6 (a) FDI Johansen Cointegration

Date: 11/08/16 Time: 21:11
 Sample (adjusted): 1982 2015
 Included observations: 34 after adjustments
 Trend assumption: Linear deterministic trend
 Series: LOG_FDIDGP LOG_EXCHVOL LOG_GDPGRW LOG_INFPCP LOG_RINTR LOG_EXGDP LOG_TAXCRP
 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 *	0.843587	173.9352	125.6154	0.0000
At most 1 *	0.695810	110.8565	95.75366	0.0031
At most 2 *	0.516911	70.39305	69.81889	0.0450
At most 3	0.486134	45.65616	47.85613	0.0793
At most 4	0.311136	23.01921	29.79707	0.2451
At most 5	0.213183	10.34702	15.49471	0.2550
At most 6	0.062525	2.195198	3.841466	0.1384

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.843587	63.07863	46.23142	0.0004
At most 1 *	0.695810	40.46347	40.07757	0.0452
At most 2	0.516911	24.73688	33.87687	0.4030
At most 3	0.486134	22.63695	27.58434	0.1895
At most 4	0.311136	12.67219	21.13162	0.4829
At most 5	0.213183	8.151818	14.26460	0.3635
At most 6	0.062525	2.195198	3.841466	0.1384

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The results from the Johansen Cointegration test indicated in figure 5.6 which computed two tests, the trace test and the Max-Eigen value. Results indicate a different reports; trace statistic indicates 3 co-integrating equations, whilst the Max-Eigen value indicates 2 co-

integrating equations. Thus it is concluded that there is cointegration in the model, in other words there is a long-term relationship between FDI and its independent variables as specified in the model. Having established that there is a long-term relationship in the model, a normalised co-integration equation on FDI is specified below

Equation 5.1

$$\text{FDI} = -0.164076 \text{ Exchvol} - 0.117516 \text{ GDP} + 0.179293 \text{ INF} + 0.079493 \text{ INTR} + 0.412996 \text{ EXP} - 2.157027 \text{ CorpTx}$$

The long-run equation displays a negative association between FDI and ExchVol. This result is consistent with the a priori expectations and theory which stated either a negative on FDI. This outcome is consistent with results of Kyereboah-Coleman and Agyire-Tettey (2008) study. This shows that a 1% increase of Exchange rate volatility will have a negative impact on FDI in South Africa.

The long-run equation indicated a negative association between FDI and GDP. This result is consistent with the a priori expectations and theory, which stated the relationship, may either be positive or negative. This is consistent with the discoveries by Brecher and Alejandro (1977); their results indicated a negative relationship between FDI and GDP growth. They explained that foreign capital can reduce economic growth due to earnings of excessive profits in the country with the severe trade distortion.

The long-run equation shows that there is a positive relationship between FDI and inflation. This result is not consistent with the a priori expectations and theory, which stated the relationship, should be negative. However, Faiza et al. (2012) studied the impact of FDI due to the growth and inflation of Pakistan. Their study also found a positive relationship existed between inflation and FDI.

The relationship between the interest rate and FDI is positive. Which is consistent with the priori expectations according to Gross and Trevino (1996) a relatively high interest rate in a host country has a positive impact on inward FDI. However if foreign investors depend on host countries capital market for FDI fund result impact could be negative.

The relationship between FDI and the measure of openness, which is exports found a positive relationship. This is consistent with the priori expectation, and with Njong (2008) study, where he explored the association between FDI and export in the case of Cameroon. His results indicated a positive impact of FDI on export through increase in supply capacity and spill

over effects. This result also confirms the concept of South African economy being an export-oriented country (Mpofu, 2014).

The relationship between FDI and corporate tax is negative. This suggests that to achieve high levels of FDI, low the country should lower corporate tax rates in order to encourage foreign investors. The result achieved is consistent with the priori expectation and also with the research conducted by the OECD (cited by Department of Finance, 2014) result indicated that a 1% rise in corporation tax results is a fall in foreign direct investment of 3.7%.

Figure 5.6 (b) Johansen Test Domestic Investment Model

Date: 11/08/16 Time: 22:40
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments
Trend assumption: Linear deterministic trend
Series: LOG_DIGRWLOG_EXCHVOLLOG_GDPGRWLOG_RINTRLOG_INFPCLOG_EXGDPLOG_POLS
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 *	0.835105	164.8550	125.6154	0.0000
At most 1 *	0.624313	103.5718	95.75366	0.0130
At most 2 *	0.540088	70.28581	69.81889	0.0459
At most 3	0.418144	43.87733	47.85613	0.1126
At most 4	0.391388	25.46524	29.79707	0.1455
At most 5	0.191045	8.581733	15.49471	0.4055
At most 6	0.039588	1.373343	3.841466	0.2412

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.835105	61.28319	46.23142	0.0007
At most 1	0.624313	33.28598	40.07757	0.2377
At most 2	0.540088	26.40849	33.87687	0.2964
At most 3	0.418144	18.41208	27.58434	0.4612
At most 4	0.391388	16.88351	21.13162	0.1776
At most 5	0.191045	7.208390	14.26460	0.4648
At most 6	0.039588	1.373343	3.841466	0.2412

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

The report from the Johansen Cointegration test in Table 5.5b are computed by two tests, the trace test and the Max-Eigen value. Results indicate a different reports; trace statistic indicates 3 co-integrating equations, whilst the Max-Eigen value indicates 1 co-integrating equations. Thus it is concluded that there is cointegration in the model, in other words there is a long-term relationship between DI and its independent variables as specified in the model.

Having established that there is a long-term relationship in the model, a normalised co-integration equation on DI is specified below

Equation 5.2

$$DI = 1.707313Exchvol + 1.451208 GDP - 1.734414INTR - 0.053380 INF - 5.938059 EXP + 23.75447 POLs$$

The relationship between DI and exchange rate volatility is positive. This suggests that to achieve high levels of DI, the country should encourage exchange rate fluctuation. This result is not consistent with the expectation priori; however an interesting theory by Darby et al (2000) proved theoretically how exchange rate volatility increases domestic investment. They explained that a volatile currency would encourage greater investment in the production of goods for foreign markets, (all things been equal) because the domestic value of those goods will be rising while the chances of being stuck with an investment which subsequently proves to be unprofitable will be getting steadily smaller. That is to say the presence of such a misalignment produces an incentive to invest in order to diversify production into exports, while the conditions in the home markets remaining unchanged.

The long-run equation shows that there is a positive relationship between GDP and DI. This result is consistent with the a priori expectations and theory. According to Tawiri (2010) domestic investment is expected to play an important role in to stimulate economic growth rates

The long run equation displays a negative relationship between DI and interest rate. This is consistent with the expected priori. According to Hansson (1986) states that a relationship that determines investment as a decreasing function of the interest rate meaning that a high interest rate causes investment to decrease however it would increase when interest rates falls.

The long-run equation also shows that there is a negative relationship between DI and inflation rate, which is consistent with the expected priori. This suggests that a 1% increase in inflation would cause a decrease in the domestic investment; this will have discouraging effects on the South African economy.

The relationship between the DI and openness, which is exports, long run equation displays a negative relationship which is not consistent with the expect priori however it's statistically significant. Therefore it means in South Africa domestic investment in the long run, is

reduced if there is a one percent increase in exports. This result is similar to Masoud Albiman and Suleiman (2016) they also found no long run relationship between DI and export in Malaysia.

The long run equation displays a positive relationship and statistically significant between DI and political stability. This result is consistent with the expected priori. This means 1 percent increase to political stability increases domestic investment because investor confidence in the country is boosted.

Therefore with the result indicating that there is co-integration for both models the analysis can precede to the next stage which is the VECM estimation.

5.5 VECM Test for FDI and DI

Having specified that a long run relationship exist between FDI and DI and their determinants the Vector Error Correction (VECM) would be estimated to capture the speed of adjustment to long-run equilibrium, which is the nest test to be conducted for both models domestic investment and foreign direct investment for the duration of this study.

Figure 5.7 (a) Results of VECM Model (FDI Model)

Error Correction:	D(LOG_FDI...	D(LOG_EXC...	D(LOG_GD...	D(LOG_INF...	D(LOG_RIN...	D(LOG_EXG...	D(LOG_TAX...
CointEq1	-1.677892 (0.34819) [-4.81887]	0.622369 (0.41675) [1.49339]	-0.177636 (0.87568) [-0.20286]	0.953983 (0.46094) [2.06963]	1.341991 (0.75477) [1.77801]	-0.101211 (0.08757) [-1.15571]	0.016552 (0.06788) [0.24383]
CointEq2	-0.381844 (0.10801) [-3.53540]	-0.126001 (0.12927) [-0.97470]	-0.467738 (0.27163) [-1.72199]	0.297105 (0.14298) [2.07794]	-0.294581 (0.23412) [-1.25823]	-0.034302 (0.02716) [-1.26273]	0.025271 (0.02106) [1.20013]
CointEq3	-0.202364 (0.04195) [-4.82443]	0.038540 (0.05020) [0.76766]	-0.059613 (0.10549) [-0.56511]	0.130851 (0.05553) [2.35647]	0.122695 (0.09093) [1.34941]	-0.015928 (0.01055) [-1.50975]	0.005361 (0.00818) [0.65562]
D(LOG_FDIGDP(-1))	0.356963 (0.20349) [1.75418]	-0.368153 (0.24356) [-1.51156]	-0.321964 (0.51177) [-0.62912]	-0.202055 (0.26939) [-0.75005]	-0.808445 (0.44111) [-1.83276]	0.101750 (0.05118) [1.98805]	0.003277 (0.03967) [0.08260]

Figure 5.7 (a) above represents the results of the Vector Error Correction Model (VECM) for foreign direct investment. The VECM shows that the Error Correction Term (ECT) term for FDI is negative (-1.68) it is significant given the t value is -4.82 which indicates that t-values > 1.96 this means that there exists a long-run relationship between the two variables .This suggests that in the event that there is disequilibrium, the model will adjust to its long-run equilibrium at about 16.8 percent of the disequilibrium is corrected within a year.

Figure 5.7 (b) Results of the VECM Model (DI Model)

Error Correction:	D(LOG_DIGRW)	D(LOG_EXC HVOL)	D(LOG_GDP GRW)	D(LOG_RINTR)	D(LOG_INFCEP)	D(LOG_EXGDP)	D(LOG_POLS)
CointEq1	-1.377337 (0.24499) [-5.62202]	0.211636 (0.08185) [2.58571]	-0.505389 (0.17108) [-2.95407]	0.449527 (0.15381) [2.92259]	0.075681 (0.08760) [0.86395]	-0.041159 (0.01899) [-2.16729]	0.003383 (0.00313) [1.08132]
CointEq2	1.734060 (0.33417) [5.18909]	-0.133424 (0.11164) [-1.19509]	0.641714 (0.23336) [2.74987]	-0.377071 (0.20980) [-1.79726]	-0.175841 (0.11949) [-1.47163]	0.028814 (0.02590) [1.11233]	-0.011254 (0.00427) [-2.63702]
CointEq3	2.089772 (0.36040) [5.79849]	-0.340863 (0.12041) [-2.83097]	0.792373 (0.25167) [3.14840]	-0.566569 (0.22627) [-2.50397]	-0.066395 (0.12887) [-0.51523]	0.060090 (0.02794) [2.15090]	-0.003151 (0.00460) [-0.68468]
D(LOG_DIGRW(-1))	0.063903 (0.17746) [0.36010]	-0.037975 (0.05929) [-0.64053]	0.118827 (0.12392) [0.95888]	-0.134874 (0.11141) [-1.21058]	-0.119739 (0.06345) [-1.88708]	0.011290 (0.01376) [0.82071]	-0.001235 (0.00227) [-0.54503]

Result

Table 5.5b above represents the results of the Vector Error Correction Model (VECM) for Domestic Investment. The VECM shows that the Error Correction Term (ECT) term for DI is negative (-1.38) it is significant given the t value is -5.62 which indicates that t-values > 1.96 this means that there exists a long-run relationship between the two variables. This suggests that in the event that there is disequilibrium, the model will adjust to its long-run equilibrium and about 13.8 percent of the disequilibrium is corrected within a year.

The variance decomposition is performed to complement the short-run VECM results. Although before that the diagnostic tests, which include the autocorrelation and heteroscedasticity tests, are conducted first to check if the VECM meet all econometric assumptions.

5.6 Diagnostic Tests

Table 5.4 a Foreign Direct Investment Model Diagnostic Tests

Test	H0	p-value	Conclusion
Normality Test	Residuals are normally distributed	0.4356	Errors are normally distributed
Serial Correlation Tests	Non-correlation in the residuals.	0.7953	No autocorrelation
Heteroscedasticity test	The residuals are homoscedastic	0.0804	No Heteroscedasticity

Table 5.4 b Domestic Investment model Diagnostic Tests

Test	H0	p-value	Conclusion
Normality Test	Residuals are normally distributed	0.5700	Errors are normally distributed
Serial Correlation LM Tests	Non-correlation in the residuals.	0.3570	No autocorrelation
Heteroscedasticity test	Residuals are homoscedastic	0.5740	No Heteroscedasticity

The results in Table 5.6a and 5.6b show that the null hypothesis of normality and homoscedasticity cannot be rejected; there is no serial correlation in FDI and DI.

Thus, the variance decomposition analysis follows to supplement these results

5.7 Variance Decomposition

The variance decomposition was also constructed to analyse the short-term interaction between the variables and the results are reported in Table 5.5

Table 5.5a FDI Variance Decomposition

Period	S.E.	FDI	EXVOL	GDP	Inflation	Interest	Export	CorpTx
1	0.3294	100.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4548	52.665	31.207	3.1598	0.1636	0.4796	6.0109	6.3137
3	0.5036	47.234	25.732	2.6119	0.2644	2.6924	8.1241	13.341
4	0.5604	41.261	22.818	2.6150	6.7891	3.1069	9.0069	14.403
5	0.6317	43.614	19.890	2.0579	12.354	3.1556	7.1016	11.826
6	0.6742	39.589	18.959	4.1395	11.363	2.8630	8.0322	15.054
7	0.6969	38.889	17.854	4.2517	10.648	2.8309	8.7878	16.739
8	0.7289	36.995	19.076	4.1698	11.687	2.7036	8.8582	16.510
9	0.7555	39.041	17.757	3.9182	12.648	2.8019	8.2670	15.567
10	0.7803	37.035	18.129	4.2494	12.578	2.9633	8.5968	16.449

Table 5.7a result shows the movements in the dependent variable that are due to their own shocks against shocks from other variables. The result shows that in the first period, all forecast errors are concentrated in FDI itself. However in the fifth period, all other variables become significant in explaining FDI. Over the long term, the results show that exchange rate

volatility followed by corporate tax and inflation is more pronounced in explaining FDI in South Africa.

Table 5.5 b DI Variance Decomposition

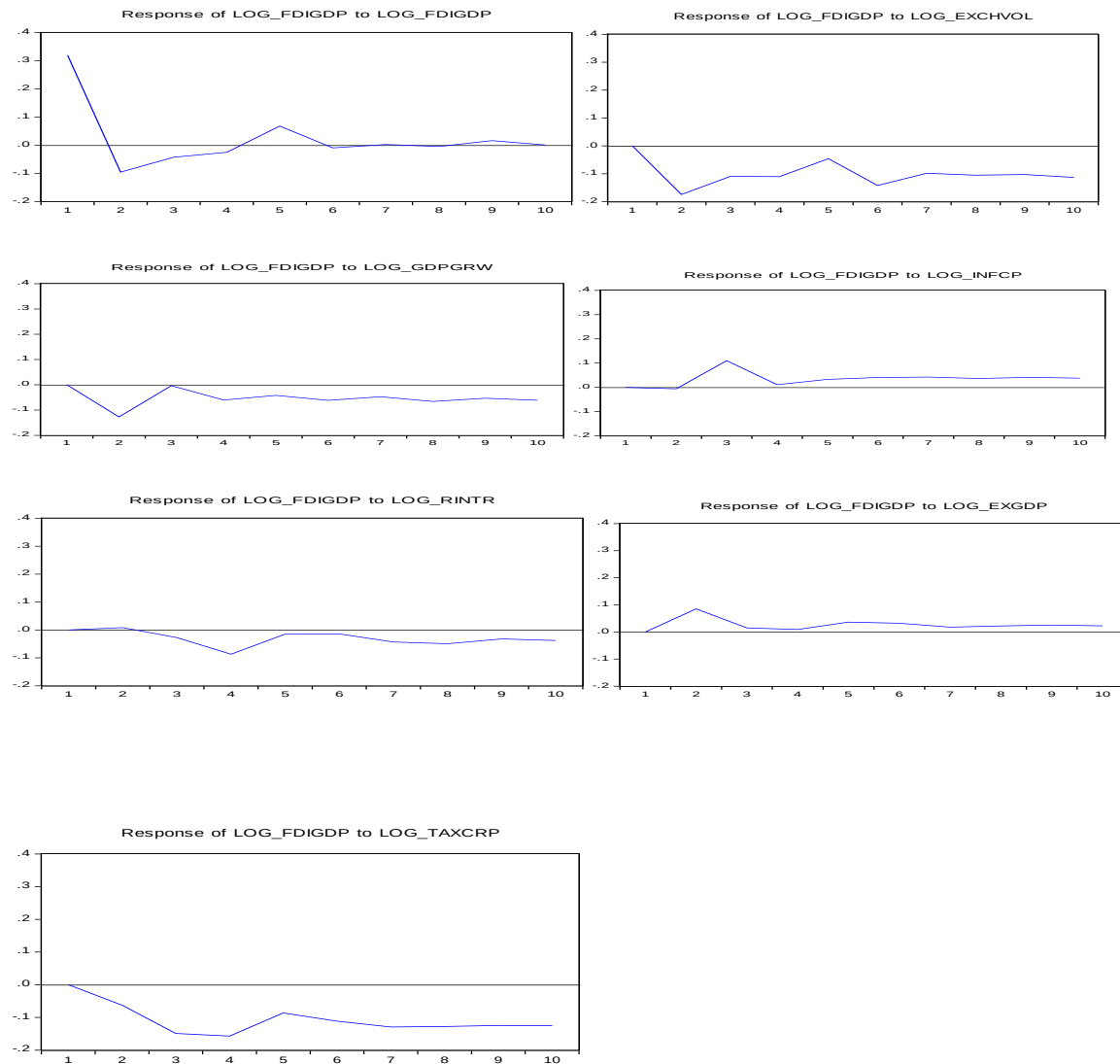
Period	S.E.	DI	EXVOL	GDP	Interest	Inflation	Export	pols
1	1.0657	100.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.7179	42.631	1.7152	10.7510	31.769	2.3507	7.4364	3.3375
3	2.2881	24.240	6.9209	10.089	40.596	2.0319	13.629	2.4933
4	2.4932	20.445	10.4023	14.412	35.389	1.7206	15.278	2.3525
5	2.6760	19.010	12.387	18.240	30.743	1.8432	15.490	2.1975
6	2.7931	19.313	12.506	20.193	28.778	1.8188	15.191	2.1998
7	2.9190	19.056	12.695	21.624	27.757	1.6842	14.946	2.2388
8	3.0657	18.109	13.008	23.009	27.068	1.5289	15.028	2.2498
9	3.2051	17.169	13.515	24.051	26.313	1.4050	15.287	2.2602
10	3.3295	16.555	13.997	25.247	25.228	1.3437	15.377	2.2527

Table 5.7b result shows the movements in the dependent variable that are due to their own shocks against shocks from other variables. The result shows that in the first period, all forecast errors are concentrated in DI itself. However in the fifth period, all other variables become significant in explaining DI. Over the long term, the results show that GDP and interest rate is more pronounced in explaining DI in South Africa, followed by Exports.

5.8 Impulse response

The impulse analysis was also performed to examine the dynamic response of FDI and DI to a positive shock on the variables

5.8 (a) Figure Impulse Response for Foreign Direct Investment

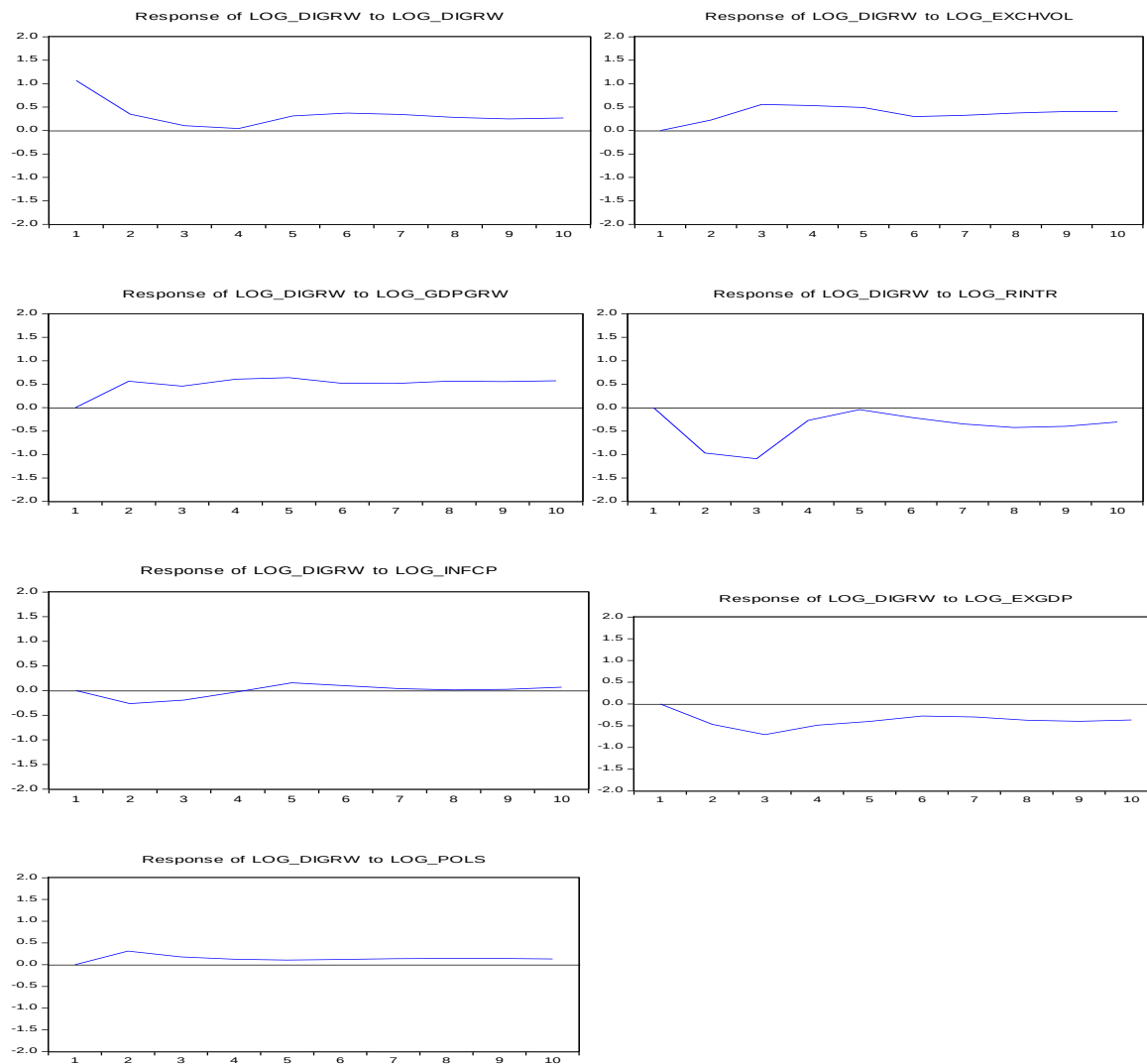


Results

Figure 5.8 (a) represents the graphical representation of the impulse response analysis for foreign direct investment and its independent variables. From the figure, it shows direction and persistent response of FDI to one standard deviation shock on variable is negative for Exchange rate volatility, GDP, interest rate and corporate tax through the period of 10 years. While inflation rates and export showed to affect FDI positively after a one standard deviation shock to it. However with FDI's shock to itself indicates it begins positively then in

its second year it slopes negatively at about (-0.10). In its fourth year it became constant. On the fifth year a positive inclination was seen then fell back to zero in its 6th year. Over the period the fluctuation became constant.

Figure 5.8 (b) Impulse Response for Domestic Investment



Results

Results for the impulse response of domestic investment indicates in Figure 5.8 (b) a one standard deviation shock on variable indicates it is positive to itself, exchange rate volatility, GDP and Political stability for the period of 10 years. While interest rates and export affects DI negatively after a one standard deviation shock to it. However with inflation a shock to it caused DI to begin negatively till its fourth year it inclined into positive, then in its 7th year the fluctuation became constant till the 10th year.

5.9 Granger Causality (Under VAR Environment)

The Granger causality tests were also estimated to analyse the direction of causality between FDI and EXvol, and DI and EXvol.

Table 5.6 (a) Granger Causality between FDI and EXvol

Dependent variable: D(FDI)			
Excluded	Chi-sq	df	Prob.
D(EXVOL)	1.163299	2	0.5590
Dependent variable: D(EXVOL)			
Excluded	Chi-sq	df	Prob.
D(FDI)	5.102369	2	0.0780

Results

This Table show the causal relationship between FDI and Exchange rate Volatility. The result indicates that when FDI dependant with a probability of 0.7333 which is greater than 5 percent. Based on these results, the null hypothesis of co-causal relationship from FDI to Exchange rate Volatility is accepted. This therefore suggests that Exchange rate Volatility does not Granger causes FDI in South Africa in the short run. With Exchange rate Volatility as dependent shows probability of 0.0780 which is also greater than 5 percent indicated that DI does cause Exchange rate volatility in the short run.

Table 5.6 (b) Granger Causality between DI and EXvol

Dependent variable: D(DI)			
Excluded	Chi-sq	df	Prob.
D(EXVOL)	0.874126	2	0.6459
Dependent variable: D(EXVOL)			
Excluded	Chi-sq	df	Prob.
D(DI)	0.880018	2	0.6440

Results

This Table show the causal relationship between DI and Exchange rate volatility. The result indicates that when DI dependant with a probability of 0.6459 which is greater than 5 percent. Based on these results, the null hypothesis of co-causal relationship from DI to Exchange rate volatility is accepted. This therefore suggests that Exchange rate Volatility does not Granger causes FDI in South Africa in the short run. With Exchange rate Volatility as dependent shows probability of 0.6440 which is also greater than 5 percent indicated that DI does cause volatility in rates of exchange in the short run.

5.10 Conclusion

The principle point of this segment was to inspect the relationship of exchange rate volatility impact on foreign direct investment and domestic investment. Chapter four presented the results obtained through the E-Views version 9. The Data used throughout this study is carefully examined by using informal and formal stationarity tests. The informal test indicated that variables were not stationary at 5 percent significance level. Therefore these variables were tested again at 1st difference and all variables attained stationarity. Stationarity was then taken through a formal test to prove if the informal test was accurate by using the ADF and PP formal test. The ADF test revealed the presence of stationarity at first level at 5% significance level.

With the information gained from the stationarity, the study was initiated with the construction of a multivariate ARCH (1), GARCH (1, 1) model of exchange rate in South Africa. The result indicated the independent variables interest rates and inflation rate have a positive relationship with the dependent variable however political stability has a negative relationship with the dependant variable. Nevertheless, through that test we gained exchange rate volatility which was the variable needed to further the analysis, thus using E-views 9 the researcher generated exchange rate volatility series, which was taken through stationarity check and discovered it was not stationary at level however obtained stationarity after first difference.

The Johansen Cointegration test was estimated on the FDI model and DI model and the trace statistic presented 3 and 3 cointegration equations respectively, whilst the Max-Eigen value indicated 2 and 3 cointegration equations respectively. Based on the studies reviewed in the chapter, the trace test took precedence over the Max-Eigen value. Also, the focus of the study was not to determine if the variables interact but to establish if there is a long-term relationship between the variables FDI and its independent variable, with focus on exchange rate volatility and DI and its independent variables with focus on exchange rate volatility. The result indicated that FDI has a negative relationship with exchange rate volatility in the long run, and with DI exchange rate volatility it had a positive relationship with it in the long run. Diagnostic tests presented in section five indicated that the residuals of all models were well behaved with the exception of DI which was tested positive for auto correlation.

The variance decomposition analysis was also tested on the models. Variance decomposition results showed result shows the movements in the dependent variable that are due to their own shocks against shocks from other variables. The result shows that in the first period, all forecast errors are concentrated in the dependent variables. However around the fifth period, all other variables become significant in explaining the dependent variables. Over the long term, the results show that GDP and inflation is more pronounced in explaining DI in South Africa while exchange rate volatility followed by corporate tax and inflation where more pronounced in FDI in the long run. And finally the granger causality test taken on the two types of investment with specific regards to exchange rate volatility showed that there was no causality between the investments and exchange rate volatility in the short run. The reliability of these findings entails applicable policies can be formulated.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Introduction

Chapter 6 presents is the plat form that would be discussing the conclusion, limitations of the study and recommendations based on the results found in the based on the findings from the study.

6.2 Study Findings

This study researched the effect of exchange rate volatility effect on foreign direct investment and domestic investment in South Africa. The study provided reviews into the country's exchange rate, foreign direct investment and domestic investment. Over the years the country has under done some transitions, from the apartheid era which was filled with racial segregation, political turbulences and social biasness. Within those times the economy went under major stress of which caused the exchange rates in the country became volatile coupled with that altered the behaviour of both foreign investments and domestic investment. However, 1994 saw the country became democratically independent, thus it went through a state of improvement. Such as changes in the exchange rate regimes, however during some of these changes the trends in investment became unpredictable. Then again exchange rate volatility weren't the only factors that influenced investment. Literature reviewed other factors that affected the flow of investments in South Africa and disclosed potential influences such as interest rate, inflation rates, tax rates, openness and political stability to mention a few were factors that influence the flow of investment.

The objectives of the study that were mentioned in Chapter 1 were all achieved in this current investigation. With the help of the literature and relevant theory discussed in chapter 2, variables were identified, namely Domestic investments, foreign direct investment, exchange rate, gross domestic product (GDP), inflation rate, export rates, income taxes and interest rate. Yearly time series data was obtained from the South African Reserve Bank (SARB) website and Quantec covering the period 1980 to 2015, the focus on this period is because it gives a clear trend of what happened before and after the apartheid era.

In studying the existence of the long-term and short term relationship between the time series, the Johansen Cointegration tests and the Vector Error Correction Model was favoured to

other techniques because of its pros over the alternative technique. For the testing and generating exchange rate volatility the ARCH (1) and GARCH (1) model was employed.

After a detailed analysis the GARCH (1, 1) model provided a high measure of volatility as 1.37 indicating the presence of high volatility in exchange rate in SA by this model, thus one of the objective of this study was achieved. The variance regressors used in the model showed to have a negative and positive relationship with the dependent variable thus another objective achieved. Thus having established the volatility a series was developed for the continuation of the study. The Johansen technique that was used allows the estimation of a dynamic error correction specification which provides estimates of both the short- and the long-run dynamics. Before estimating the Johansen co-integration tests, the time series properties of the data were examined using both the formal and the informal tests for stationarity. The results indicate that the variables are integrated of order one $I(1)$. The lag length used in the study was chosen based on the AIC and the SC criteria which chose a lag of 2 respectively. Hence for the estimation of the Johansen Cointegration test, the study therefore used lag length of 2. In the model, the null hypothesis of no co-integration was rejected at the 5% level. The results indicate that there exists a long-term relationship between as specified in the model. Having established the existence of a long-term relationship between FDI and its determinants and DI and its determinants the VECM was required of which it provided the parameter estimates of both the long-run and the short-run estimates of the variables. The long-run cointegration equation showed that there is a positive and significant relationship between FDI and exchange rate volatility and also with DI and exchange rate volatility. The models were taken through diagnostic tests for robust check and the results indicate that for normality the null hypothesis was rejected, there was no serial correlation and no heteroscedastic for both FDI and DI models. The result then suggests that the models estimated observed all the important assumptions and can be certain. A Granger causality tests was taken on the models result indicated that exchange rate Volatility does not Granger causes FDI in South Africa in the short run, same with DI exchange rate volatility does not granger cause DI in the short run .

6.3 Policy Recommendations

A number of policy implications can be drawn from the findings of the study. The results indicates that FDI had positive and statistically significant relationships with Inflation rates, interest rates and export which is a proxy for trade openness. The results are consistent with other studies except the results attained between inflation and FDI however a similar result

was attained by these authors Faiza et al. (2012). According to Gerolamo, (2014) if majority of foreign investment is stocks then investors won't be bothered by inflation because in the long run, a company's revenue and earnings should increase at the same pace as inflation. Inflation may reduce investment when investors get discouraged on their investments that take a long time to mature. The result showed that exchange rate volatility, GDP and Corporate tax have a negative relationship with FDI. This implies the variable with positive relationship with FDI if increased by 1 percent would increase FDI, while variables with negative relationship if increases by 1 percent would decrease FDI in South Africa.

Hence based on the long run findings it is recommended that government should control fluctuations in exchange rate, because uncertainty of exchange rates trend in the country decreases FDI and this is consistent finding of Kyereboah-Coleman and Agyire-Tettey (2008) their studies indicated that exchange rate fluctuations tend to have a negative effect on investments in the long-run. Since GDP and Corporate tax that also indicated a negative relationship government should monitor them. With inflation, interest rate and export policy should be implemented to increase these variables in order for the country to increase its FDI inflow.

The results from DI model indicates a long run relationship with exchange rate volatility, which was inconsistent with expectations however an increase in volatility causing domestic investment to increase can be explained theoretical by Darby et al (2000) according to them a volatile currency would encourage greater investment in the production of goods for foreign markets, (all things been equal) because the domestic value of those goods will be rising while the chances of being stuck with an investment which subsequently proves to be unprofitable will be getting steadily smaller. That is to say the presence of such a misalignment produces an incentive to invest in order to diversify production into exports, while the conditions in the home markets remaining unchanged. In the result it is indicated a positive relationship exist between DI and GDP and political. Also indicated in the result was a negative relationship between DI and interest rate, inflation and export the long run. Similar to FDI the results imply the variable with positive relationship with DI if increased by 1 percent would increase DI, while variables with negative relationship if increases by 1 percent would decrease DI in South Africa. Hence based on the long run findings its recommended inflation, interest rate, and exports should be monitored in order to increase domestic investment. While all variables that have positive relationship with DI should be encouraged

6.4 Limitations of the Study and Areas of Further Research

The study focused on examining the effect of exchange rate Volatility effect on FDI and DI in South Africa. The issue confronted by the researcher is the unavailability of data of variables suggested by theoretical models, leading to the elimination of certain variables which could have been used in the study.

Further research can be conducted on determining the impact investment has on exchange rate volatility, also a study on the impact of exchange rate volatility on the different investment sectors in South Africa.

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APPENDIX

Appendix 1 Autocorrelation for Exchange rate volatility model

Date: 12/06/16 Time: 23:15

Sample: 1980 2015

Included observations: 36

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
		1	0.072	0.072	0.2039	0.652
		2	-0.222	-0.228	2.1861	0.335
		3	0.023	0.062	2.2071	0.531
		4	-0.083	-0.151	2.5004	0.645
		5	-0.069	-0.028	2.7105	0.745
		6	0.250	0.222	5.5709	0.473
		7	0.078	0.014	5.8580	0.556
		8	-0.206	-0.127	7.9379	0.440
		9	0.023	0.059	7.9636	0.538
		10	0.111	0.077	8.6175	0.569
		11	0.114	0.182	9.3323	0.591
		12	-0.078	-0.178	9.6786	0.644
		13	0.018	0.074	9.6980	0.718
		14	0.022	0.064	9.7285	0.782
		15	-0.216	-0.217	12.781	0.619
		16	-0.106	-0.148	13.542	0.633

Appendix 2 Auto correlation for FDI model

VEC Residual Serial Correlation LM T...

Null Hypothesis: no serial correlation ...

Date: 12/07/16 Time: 00:15

Sample: 1980 2015

Included observations: 34

Lags	LM-Stat	Prob
1	40.68031	0.7953
2	47.83788	0.5203
3	52.97574	0.3234
4	39.46891	0.8327
5	55.06489	0.2560
6	53.63849	0.3010
7	29.37465	0.9882
8	62.06086	0.0996
9	56.35404	0.2191
10	80.45457	0.0031
11	52.34557	0.3455
12	49.99291	0.4337
13	40.88699	0.7885
14	35.92579	0.9180
15	39.09516	0.8434
16	62.46870	0.0936

Appendix 3 Autocorelation for DI model

VEC Residual Serial Correlation LM T...
 Null Hypothesis: no serial correlation ...
 Date: 12/07/16 Time: 00:06
 Sample: 1980 2015
 Included observations: 34

Lags	LM-Stat	Prob
1	52.02287	0.3570
2	44.62452	0.6510
3	60.15559	0.1319
4	42.70171	0.7249
5	58.03383	0.1766
6	43.20169	0.7063
7	55.84115	0.2333
8	53.03516	0.3214
9	35.16213	0.9315
10	58.91169	0.1570
11	70.17886	0.0252
12	59.03682	0.1543
13	69.91224	0.0265
14	64.64895	0.0663
15	64.47286	0.0682
16	74.74045	0.0104