

**The effects of exchange rate volatility on South African investments**

**By**

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## **DEDICATIONS**

This dissertation is dedicated to my loving mother, Mmakgomo Violet Mphuthi, for always being my pillar of strength and my number one supporter. To my brother, David Maepa, little sister, Rethabile Mphuthi, and my aunt, Merriam Maepa, for their continued love and support.

## **DECLARATION**

I, Magdeline Maepa, hereby declare that this dissertation titled:

### **The effects of exchange rate volatility on South African investments**

Is of my own unique work and that it has not been submitted by anyone else aside from myself, and will not be presented at any other university, other than the North-West University: Vaal Triangle Campus, for a similar or any known degree award.

## ABSTRACT

This study analysed the short- and long-run interactions between the exchange rate and different types of investments in South Africa from 1970 to 2014. The study focussed on the portfolio theory, the life cycle of investment and the accelerator model of investment, which all found that investment plays an important part in the economic growth and development prospects of a country, thus a healthy investment environment needs to be present in order to attract investment inflows into the country. The conceptualisation of exchange rates focussed on the definitions and types of exchange rates that are in existence, as well as the theories of exchange rate determination which included the purchasing power parity, the interest rate parity, the portfolio balance approach and the Balassa-Samuelsion model. These theories are all different but are essential for this study as assumptions made by these theories are relevant to the explanations of exchange rates.

The Vector Autoregressive model (VAR), a multivariate Johansen co-integration approach and Granger causality test were conducted to analyse the interactions between the exchange rate and different types of investments. The short-run analysis found that there was a short-run relationship between the exchange rate and different types of investments in South Africa. However, this short-run interaction were found to be small, thus, not significant enough to cause disruptions to the exchange rate and to the inflow of investments into the country. The long-run analysis found that a there was a long-run relationship between the exchange rate and different types of investments in South Africa. This long-run relationship was also found to be negative. This study concluded that investments 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.

**Keywords:** Exchange rate, domestic credit extension to the private sector, private domestic investment, foreign direct investment, foreign portfolio investment, South Africa

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## **LIST OF ABBREVIATIONS**

GDP	Gross domestic product
SARB	South African Reserve Bank
RER	Real effective exchange rate
PDI	Private domestic investment
FDI	Foreign direct investment
FPI	Foreign portfolio investment

## CHAPTER ONE: INTRODUCTION AND BACKGROUND

### 1.1 Introduction

The allocation of public resources from government to the general public is, in many a times, not enough to address the development as well as the economic goals set forth by the government. Hence the mobilisation of investment is an essential ingredient for the development of an economy, especially in developing economies such as South Africa. Increased levels of domestic private investment should also aid in attracting more foreign investment and technological development into the country as well (White, 2005:5-9). Private firms, whether large or small, play an important role in the journey of a country obtaining its overall investment and economic growth objectives. Driven by the quest for profits, private firms invest in new ideas and new facilities that strengthen the foundation of economic growth and prosperity (World Bank, 2004:1).

During the last two decades, South Africa has made significant economic head waves. The country came out of the economically, physically, emotionally and mentally crippling apartheid era, and has emerged as a fast emerging country, one to be reckoned with across the world (Mwakikagile, 2008:15). Investment has played a rather significant role in the growth of the South African economy, with trade inflows increasing tremendously into the country over the past 20 years, contributing about 2.7% of the total Gross Domestic Product (GDP), and with this increased investment came the improved transfer of technology and knowledge with other participating countries globally (Parajuli, 2012:1).

Investment forms a pivotal part of GDP, and can be classified in 2 broad categories of domestic and foreign investment (Dornbusch *et al.*, 2011:359). Domestic investment can be formally defined as all investment spending made by non-foreign enterprises (Research and Education Association, 2002:161). This includes all spending on machinery, equipment and all necessary physical resources; all construction as well as all changes in inventories essential to these enterprises (Research and Education Association, 2002:162). Gross private domestic investment is one of the most important sources of income for developing countries, such as South Africa, that are rich in raw minerals and heavily dependent on exporting such raw minerals. Foreign investment, on the other hand, can be defined as the investment which is made to acquire either short-term or long-term interest in the corporations within a specific economy by foreign investors (Blaine, 2009).

Among the factors that may affect the investment prospects of a country, there is an exchange rate which serves as an international price for determining the competitiveness of a country (Carbaugh, 2000:420). The real exchange rate plays a crucial role in leading the whole allocation of production and spending in the domestic economy between international and local goods (Takaendesa, 2006:2). To add to this, a domestic currency is often considered to be amongst the financial assets that local investors may want to hold (Carbaugh, 2000:421), implying that there may be interactions between exchange rates and investment.

Many studies (Campa & Goldberg, 1999; Diallo, 2008; Razin & Collins, 1997) that have conducted research on the effect of exchange rates and investment have found that not properly managed and controlled exchange rates can be disastrous for any country's economic growth, more especially the investment component of the GDP, which is of utmost importance for the economic growth of any country, especially a developing country such as South Africa (Johnson *et al.*, 2007; Rajan & Subramanian, 2007; Razin & Collins, 1997). One of the key factors of the economic growth which is indirectly affected by changes in the exchange rate is the different types of investments within a country. Cross-country empirical studies (Johnson *et al.*, 2007; Rajan & Subramanian, 2007; Razin & Collins, 1997) show that for the economy to obtain and maintain its gross investments, which come into the country from foreign investors, high levels of fluctuations in the currency should be avoided.

The South African economy has undergone a series of exchange rate regimes from the period of 1945, before settling for the free-floating exchange rate which is currently still being used as the official exchange rate regime for the country. In 1995, South Africa abandoned the fixed exchange rate regime and opted for a flexible exchange rate system (Van der Merwe, 1996:8). This adoption of the flexible exchange rate system exposed the country to the numerous dangers of exchange rate fluctuations. For example, the South African rand depreciated by about 5% against the US Dollar since January to the end of May 2014 (News24, 2014). These exchange rate fluctuations can encourage or discourage foreign investment flows into the country.

Previous studies (Crowley & Lee, 2003; Dooley *et al.*, 2003; Parajuli, 2012; Rodrik, 2008) have been conducted on exchange rate volatility and investments have found that there exists a relationship between foreign direct investment (FDI), exports, the exchange rate and economic growth. A study (Diallo, 2008) conducted on the relationship between exchange rate uncertainty and domestic investment, and found that exchange rate volatility, both a

depreciation and appreciation of the currency, had a strong negative effect on the inflow of investment more especially in low income and middle income countries.

A study by Aizenman (1992) conducted on the relationship that exists between exchange rate volatility and its effects on domestic and foreign direct investment within developing countries, found that a fixed exchange rate yields more positive investment results, and is more suitable to domestic and foreign investment, as opposed to a flexible exchange rate. While many studies have been conducted on the interaction between exchange rate fluctuations and investment but none has been able to conduct a research on the interaction between exchange rate volatility and the effect that it has on the behaviour of domestic and foreign investment in the South African economy. This study, thus, aims to examine the possible interaction that may exist between movements of the real exchange rate, as the most important indicator to macroeconomic instability, and domestic and foreign investment within the South African context.

## **1.2 Problem statement**

The South African economy is one of the economies in the world which has committed itself to maintaining an open environment for investments and international markets, and therefore the fluctuations that occur in these international markets tend to affect investments in South Africa (National Treasury, 2011). This openness of the South African economy affects the exchange rate, which has gone through a series of regime changes, which in turn affects the investment prospects of country. Both the domestic and foreign investments of the country tend to be affected by the volatility of the exchange rate, especially since the country makes use of the free floating exchange rate.

The South African exchange rate has been through a series of fluctuations, and most notably so during the last 44 years (1970 – 2014) whereby the country's exchange rate system went through an evolution of exchange rate regimes since the second world war (Van der Merwe, 1996:1). The South African rand has been depreciating, against the US Dollar, since the beginning of the 2012 financial year, with the depreciating exchange rate level averaging at 9% (CEIC Data, 2016). During the beginning of the 2015 financial year (January – March), the depreciating exchange rate was at its highest recorded rate of 12.45% (Trading Economics, 2015). Thus, the key question to ask is how investments, both domestic and foreign, responded to these fluctuations of the rand. This question has not fully been

answered in literature regarding the relationship between South Africa's exchange rate volatility and investments as findings from studies on the effects of exchange rates on various macroeconomic variables, more especially investment and economic growth (Berman *et al.*, 2012; Campa & Goldberg, 1999; Forbes, 2002; Goldberg, 1993; Osinubi & Amaghionyeodiwe, 2009) show that there is no consensus on the link between exchange rates and investment. Some studies found that a depreciation of the exchange rate encourages investment, while others found that an exchange rate appreciation results in a decline in new investment (Osinubi & Amaghionyeodiwe, 2009:84). Thus, there is a need of investigating the full effect of exchange rate volatility on investments in South Africa, especially during the present period where the South Africa currency tends to be a volatile currency in the global market.

### **1.3 Objectives of the study**

The following objectives have been formulated for the study:

#### **1.3.1 Primary objectives**

The main objective of the research study is to assess the possible effect of a real exchange rate may have on various types of investments such as foreign and domestic investment in South African. To achieve this main objective, the following theoretical objectives are developed:

#### **1.3.2 Theoretical objectives**

The following theoretical objectives are to be developed for this study:

- To provide theoretical explanations of the exchange rate;
- To review the historical concepts explaining the different types of exchange rate regimes in South Africa;
- To provide the theoretical explanations of domestic and foreign investments; and
- To provide theories linking an exchange rate regimes' volatility on investments.

#### **1.3.3 Empirical objectives**

In line with the primary objectives of the study, the following empirical objectives are formulated:

- To identify the trend of the growth of different types of investments since 1970;
- To determine the trend of exchange rate volatility since 1970;
- To establish the interaction between exchange rate volatility and domestic investment in South Africa;
- To establish the interaction between exchange rate volatility and foreign investment in South Africa;
- To determine how changes in exchange rate regimes affects different types of investments in South Africa; and
- To review empirical studies on the link between exchange rates and investment.

## **1.4 Research design and methodology**

This study will comprise a literature review and empirical study.

### **1.4.1 Literature review**

Secondary sources such as journals, thesis', books, academic and commercial abstracts, bibliographic databases and the internet search engine have been used to access necessary information sources. The literature review will include both theoretical literature as well as empirical literature to help explain the relationship that may exist between exchange rate volatility and the different types of investments, especially in a developing economy such as South Africa.

### **1.4.2 Empirical study**

#### **1.4.2.1 Data collection and sampling**

To study the effects of exchange rate volatility on investment this research study will make use of secondary data on different variables, which includes the real effective exchange rate, and the different types of investments, namely domestic and foreign investment. The domestic investment variable includes two components, namely the domestic credit extension to the private sector and private domestic investment. The foreign investment variable includes two components, namely total portfolio investment and total direct investment. The growth in the total inflow of foreign direct investment and foreign portfolio investment was made use of in the analysis of foreign investment.

The study period is 1970 – 2014, this period includes the different exchange rate regimes changes that the South African economy went through before finally settling for the free-floating exchange rate in 1995. This is the period that data is available for all variables. Data is available from the South African Reserve Bank (SARB), with the data being made available on a frequency of a monthly and annual basis

#### 1.4.2.2 Data analysis

The main aim of the study is to estimate the relationship between exchange rates and investment, and to achieve this empirical objective the first and most appropriate manner of modelling this relationship is the Vector Autoregressive (VAR) model. The VAR model is a model which treats variables equally, in which each variable is regressed against its own lags and the lags of all the other variables included in the regression (Sims, 1980). This model is the starting point of analysis, and is usually followed by other analysis such as the co-integration testing technique, which tests for co-integration between variables; the vector error correction model, which is a model that determines the relationship between variables and aims to correct any errors that may occur in the variables (Brooks, 2002). The VAR model for this study is as follows:

$$LRER_t = \sum_{i=1}^n \beta_{1i} LRER_{t-i} + \sum_{i=1}^n \gamma_{1i} LINVEST_{t-i} + e_{1t} \quad (1.1)$$

$$LINVEST_t = \sum_{i=1}^n \beta_{2i} LRER_{t-i} + \sum_{i=1}^n \gamma_{2i} LINVEST_{t-i} + e_{2t} \quad (1.2)$$

Where:

$LRER_t$  is the log of the real exchange rate at period  $t$ .  $LINVEST_t$  is the log of the real investment at period  $t$ .  $\beta_{1i}, \beta_{2i}, \gamma_{1i}$  and  $\gamma_{2i}$  are the coefficients to be estimated;  $e_{1t}$  and  $e_{2t}$  are the error terms known as shocks in a VAR model; and  $n$  is the number of lags in the VAR model.

The Granger causality test, which tests whether one variable in time series analysis is useful in forecasting another variables, and the GARCH model, which is an approach used mainly in econometrics to estimate volatility in financial markets, will also be estimated in this study.

### 1.5 Importance of the study

It is of imperative importance that the effect that exchange rate volatility has on the different types of investments in a country be evaluated, especially in a developing, country such as

South Africa, where the exchange rate has been through a process of appreciating and depreciating. The findings in this study will aim to benefit investors on the types of domestic and foreign investments to invest in South Africa, as well as at which point in time to make such investments. This will not only benefit investors but will also benefit the growth of real investments in the South African economy. Policymakers will benefit from this study in terms of formulating appropriate policy strategies, for both monetary and fiscal policy, in order to enable the steady growth and development of the South African economy. This study will also add on to the existing literature on the relationship between exchange rates and investments.

Thus, it is important that the impact that exchange rates, especially those that are operating and affected by the global financial markets, should be analysed accordingly.

## **1.6 Chapter outline**

The study is divided into 6 chapters. The format of the study is as follows:

**Chapter 1- Introduction:** The first chapter of the study will be the introduction and the background of the study. It consists of the problem statement and the objectives that have been set forth for the study. These objectives include both theoretical and empirical objectives.

**Chapter 2 – Literature Review:** The second chapter will be the literature review, which consists of the theories about investment and exchange rates, as well as the theoretical and empirical studies that have been conducted concerning the interaction between exchange rate volatility and types of investment.

**Chapter 3 – Exchange rate regimes and different types of investments in South Africa:** The third chapter is dedicated to the explanations of the exchange rate regimes in the world, as well as the historic review of the different exchange rate regimes that South Africa has made use of throughout 1970 to 2014. The chapter also includes the trend of different types of investments in South Africa over the period of the study.

**Chapter 4 - Methodology:** The fourth chapter consists of the methodology which tests the relationship between exchange rate volatility and different types of investments in South Africa.

**Chapter 5 - Research findings:** Chapter five looks at the presentation and analysis of the empirical findings in this study, this chapter will provide a summary of the study findings. This chapter will conduct numerous tests to determine how changes in exchange rate regimes affect the different types of investments in the South African context.

**Chapter 6 – Conclusions:** Finally, chapter six is dedicated to the conclusions of the study, and also discusses the possible policy recommendations and considers possible opportunities for further research on this research topic.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

Exchange rate movements have a number of implications for a range of economic variables in a country's quest to reach economic growth and development. In particular, exchange rate movements can have a number of implications for investments, both domestic and foreign investments (Harchaoui *et al.*, 2005:1). Theoretically, changes in exchange rates have contradicting effects on investments, depending on which side the changes in the exchange rate occur. Currency depreciation tends to improve the international competitiveness of a country's exports and may even help improve the country's trade deficit in the long-run. However, this depreciation comes with foreign investors pulling out investments from the country, all in the fear of the currency depreciating further (Goldberg, 2009:1-3). Therefore, this chapter aims to discuss the theoretical concepts of exchange rates and investments together with a review of empirical studies on the linkage between exchange rates and investments. The chapter is divided into two sections, the first section includes the theoretical literature which focuses on explaining the relationship between exchange rates and investments, and the second section deals with the empirical studies on relationship between exchange rates and different types of investments.

### **2.2 Conceptualisation of investments**

There has been contradiction, both theoretically and empirically, with regards to the effects that exchange rate volatility has on investment. Numerous theoretical research has been conducted in order to determine the relationship between exchange rates and investments, which have yielded complex conclusions (Denisia, 2010:104). This is why it is important for the conceptualisation of investments and exchange rates needs to be included in this study, in order to understand the interconnectivity of these two variables.

This sub-section of the study focuses on the fundamentals surrounding the existence and importance of investments. This sub-section will include the definition of investments, types of investments, concepts of investments, the reasons for investments, and ending of with the theoretical explanations that exist with regards to investments.

### 2.2.1 Definitions of investments

Investment can be broadly defined as the process of entering into a purchasing agreement to acquire property or goods that are not consumable in the present day, but are rather consumed at a later stage in the future for the purpose of creating and preserving wealth over a period of time (Dictionary.com, 2015). Investments can be made through investing in products or unit trusts in any industry, with the choice of investment ultimately lying with the investor's objectives, priorities, financial status and their overall ability to tolerate risk (Allan Gray, 2015).

### 2.2.2 Types of investments

There exist a number of three basic types of investments, which investors may wish to invest in. This sub-section focuses on the discussion of the ownership investment and the debt investment.

- **Ownership investments** – Ownership investments can be defined as the type of investments which investors purchase in exchange for the ownership of a portion of a company, or corporation (eXtension, 2015). Ownership investments come 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 (Farlex, 2015). Ownership investments also come in the forms of making an investment in a business through starting a business or through the acquisition of a business domestically or in another country (Beattie, 2015). 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 (Parker, 2010:3).
- **Debt investments** – This type of investment is described as the kind of investment which allows for investors to acquire a portion of a corporation through the purchase of either bonds or debentures (Business Dictionary, 2015). This acquisition yields interest to the investor at the end of each financial period that the acquisition is made (Investopedia, 2015).

### 2.2.3 Concepts of investments

When a potential investor is considering his/her investment goals, it is important for them to take into consideration a number of factors that may determine the type of investment to purchase (Carosa, 2013). Planning and discipline form an important part in an investors' investment decision-making, which requires one to keep track of the investment portfolio's movements and the risk that are associated with the investment (Vanguard, 2015:5).

This sub-section of the study aims to provide an overview of the four most important factors to consider when one decides to invest, be it in the short-run or in the long-run. These factors: (1) the risk/return trade-off, (2) the significance of time, (3) asset allocation; and (4) portfolio diversification. These factors are outlined below.

#### 2.2.3.1 Risk/return trade-off

The expected value of an investment may experience fluctuations which may result in investors receiving returns that are less than the invested amount (Vanguard, 2015). These fluctuations are referred to as risks. Risk, in the context of investment, can be defined as the uncertainty associated with the achievement of a set of investment objectives which may result in the loss of a portion of an investment (MLC, 2013:4). There exist a number of risks which can affect the performance of an investment, that investors should be aware of and should have a certain level of understanding (Vanguard, 2015:1). Some of the risks which may affect an investment portfolio include (Mpofu *et al.*, 2013:6):

- **Exchange rate risk** – Exchange rate risk is defined as the risk of an investment's rate of return declining due to a fall in the exchange rate of the country in which the investment has been made.
- **Inflation risk** – Inflation risk is defined as the risk that an investment's rate of return may be below that of the current inflation rate, leading to a decline in the return of the investment.
- **Liquidity risk** – This risk is defined as the risk associated with the ease or difficulty of purchasing or selling an investment. Some investments may be difficult to sell due to the risks that the investments are exposed to, or due to there being a lack of buyers in the market.

- **Market risk** – Market risk is the uncertainty associated with the performance, or the instability of the market in which investments are made. Fluctuations in the market movement may have an adverse effect on investment returns over time.
- **Interest rate risk** – Interest rate risk is the risk of a fall in domestic interest rates, which may have a negative effect on the anticipated returns of an investment.
- **Political risk** – Political risk is defined as the risk of the change in legislation that may lead to political and social unrests, which may adversely affect the returns of an investment.

According to MLC (2013:4) all investments are exposed to certain levels of risks, with the highest rates of returns being associated with investors having a higher level of risk tolerance. Thus, before an investment agreement is entered into, an investor needs to evaluate the desired investment products and determine the risks that can be tolerated.

#### **2.2.3.2 The significance of time**

The importance of time in an investment portfolio refers to the higher amount of interest that can be earned from an investment over a prolonged period of time (Mpofu *et al.*, 2013:6). Over time, the gains associated with an investment tend to increase especially when the returns earned on an investment is reinvested, or rather compounded (Vanguard, 2015:6). Compounding interest refers to the reinvestment of interest earned from an investment, with the aim of increasing investment gains over a longer period of time, which is reinvesting the investment for a higher future value (McKeown-Moak & Mullin, 2014:310).

#### **2.2.3.3 Asset allocation**

Asset allocation can be defined as the process in which an individual investor's wealth is allocated amongst a group of asset classes and within different countries, with the aim of achieving a specific rate of return given a certain level of risk (MLC, 2013:5). This process is entered first by making use of the individual investor life-cycle, in order to establish in which phase of the individual investor life-cycle an investor is currently positioned in (Harty, 2014). After establishing the stage in which an investor is positioned in, in the investment life-cycle phase, an effective allocation of the investor's wealth can be done (Harty, 2014).

#### **2.2.3.4 Portfolio diversification**

Portfolio diversification refers to the process of spreading an investor's investments across a broad spectrum of asset classes, in order to reduce the unsystematic risk that is associated

with the investment portfolio (Nasdaq, 2011). Unsystematic risk is defined as the risk of a fall in the investment portfolio's returns because of the company that the investments have been made in, which can be reduced through the use of diversifying an investors' investment portfolio (Investopedia, 2015).

#### **2.2.4 Reasons for investments**

There are a variety of reasons for individuals and corporations choosing to enter into domestic and foreign investment transactions, and this is based primarily on investors' availability of funds, and their investment goals and objectives (Barclays Stockbrokers, 2015). The reasons put forth in this sub-section are grouped into two main categories, namely investing for growth and investing for income (Barclays Stockbrokers, 2015).

- **Investing for growth** – Investing for growth refers to making investments with the goal of ensuring a higher value of an investment over a period of time (Fidelity, 2015). This type of investing requires patience from investors as most growth investments are made in either small-cap companies which are expected to grow at a favourable rate for the investor; or investing in small companies that have not been made public, that have the potential of showing growth over a period of time (Fidelity, 2015). Growth investors are also typically involved in the assessment of the corporation, and are actively involved in the assessment of the management of the corporation to ensure that company activities move towards growth (Ang & Chng, 2013).
- **Investing for income** – Investing is one of the many ways in which individuals and corporations can generate an income stream. Investing in fixed-income investments earns investors an income, which is usually paid out on a fixed investment schedule (Barclays Stockbrokers, 2015). Other investments can also be made which pay out dividends to investors, with dividend pay-outs being made on a regular basis, depending on the performance of the company in which the investment has been made (Megginson & Smart, 2010:576).

## **2.2.5 Theoretical explanations of investments**

Over the past decades, an increased rate of investments have played a big part in stimulating international economic integration and has increased the economic growth of many economies, most especially emerging markets (Phillips & Ahmadi-Esfahani, 2008:505). Investments form an important part in the creation of wealth of people and countries, and one of the most important decisions that are taken by investors in the investment process is the allocation of asset in their investment portfolio (Mpofu *et al.*, 2013:3) Thus, investment is a key aggregate in the creation of not only wealth, also in the integration of international economics.

There exist a number of theories that provide explanations on investments which all have advantages and disadvantages attached to them, but for the purpose of this study the focus will only be on three theories namely the modern portfolio theory; the life cycle of investment theory and the efficient market hypothesis. These theories were chosen for this study because till this day these theories are still relevant to the study of investments, and are being used worldwide. Investment theories are used as a guide and an aid to investors on the kind of investments to make. These theories provide investors with the necessary resources on the allocation of their money and other financial assets in order to make adequate investment decisions.

### **2.2.5.1 The modern portfolio theory**

The modern portfolio theory is a financial investment management theory, developed by Harry Markowitz in 1952, is mainly based on the assumption that investors, who have a strong dislike for risk, have the choice of constructing investment portfolios which are concentrated on maximising their expected return, given a certain level of risk (Markowitz, 1952:76). Investment portfolios are an investment management strategy of integrating a myriad of different investments that are held by an investor into a single diversified portfolio, with the aim of gaining higher returns, while also seeking to minimise the risks of the investments (Fin24, 2014). These investments may range from safe to risky (Dash, 2009:11). In the world of investment, there exist a number of reasons for making investments, with the most prominent of the reasons being the maximisation of investment returns.

Thus, the main aim of this theory is not only to provide investors with an efficient portfolio, which is a portfolio which ensures the highest possible rate of returns with minimal risk, but

also to help investors in classifying, controlling and deciding on the kind and amount of risk and returns that is to be expected from an investment portfolio. This is mainly because investment portfolios usually have long-term objectives for investors which require adequate monitoring and evaluations (Mandelbrot, 2004; Omisore *et al.*, 2012:19).

According to the modern portfolio theory, investors need to establish a composition of asset classes which will yield the highest level of returns, given a certain level of risk (Markowitz, 1952:76). However, for this composition to be established, investors need to make use of the Markowitz efficient frontier. The efficient frontier is essentially a graphical illustration that represents portfolios that are diversified efficiently for an investor, making it difficult for any other combination of asset classes to yield a higher expected return, given a certain level of risk (Reilly & Brown, 2012). According to Markowitz (1952:77), the whole process of selecting an investment portfolio can be divided into two stages. Firstly, stage one of the process begins with the observation and experience of available securities, and concludes with the investor's beliefs and perceptions of the available securities' future performance. The second stage of selecting an investment portfolio begins with the beliefs and perceptions that an investor has with regards to the available securities' future performance. This stage then concludes with an investor making a selection of a portfolio that is relevant and matches his/her risk-return ratio.

There exists a rule when it comes to the analysis of an investment portfolio for the purpose of making a rate of return on an investment (Osimore *et al.*, 2012:19). This rule states that an investor should maximise the discounted value of a portfolio's future returns. This rule is based on the assumption that it is extremely difficult to predict the future with certainty, therefore it should be expected or anticipated that future returns should be discounted for that specific reason (Osimore *et al.*, 2012:19).

Every theory that has been formulated has been tied up to a number of basic assumptions, and the modern portfolio theory is no different in this regard. The following assumptions are associated with the modern portfolio theory (Osimore *et al.*, 2012:22-23):

- Investors with the desire to invest are price takers, and thus they and their actions have no influence on prices in the market in any way.

- All investors interested in forging forth with their investment portfolio making use of the modern portfolio theory are assumed to be rational in their investment decisions and risk-averse, with their main aim being the maximisation of portfolio returns.
- All information, according to this theory, is made available to all investors at the same time, meaning that no single investor has the opportunity to make abnormal returns because all relevant information is available to everyone at the same time.
- All investors have access to borrowing and lending any amount of money at a return that is risk free. This assumption is also further coupled with the added assumption that there are no transaction costs or taxes associated with the monitoring and management of investment portfolios.

Essentially the importance of this theory is that it assumes that in order for an investor to maximise expected returns, the investor should carefully diversify his/her portfolio into different asset classes across different sectors or industries. In this way, the investor ensures minimum risk for a given level of expected return. This diversification of portfolios eliminates the risk known as unsystematic risk, which is the risk of loss due to industry specific hazards which are present in every investment (Bodie *et al.*, 2009:8). The main benefit of diversification is, of course that the overall risk of an investment portfolio could be significantly lower than that of either of the single assets that may have been included in the investment portfolio individually. Thus, this theory's concept on diversification is that assets should not be selected in an investment portfolio on an individual basis, and another advantage of diversification is that it has also been proven to combine perfectly negatively correlated assets into an investment portfolio, with the markets being efficient and investors being rational (Reilly & Brown, 2011; Osimore *et al.*, 2012:21). This makes diversification a rather desirable feature in an investment portfolio.

The main argument against this theory is that it does not provide any guidelines, whatsoever, as to the security risk premiums which are necessary in order for the efficient frontier of risky assets to be computed. An important element of the construction of efficient frontiers is forecasting. Portfolios need to be able to forecast earnings, share prices, as well as volatility for a possibly of thousands of stocks on a regular basis (Bodie *et al.*, 2009:8-9). A second disadvantage of the model is that since the theory is based on expected returns and makes use of historical market information to model the likeliness of portfolio losses, it does not provide

a factual model of the true representation of the market. The last disadvantage associated with this theory is that the model is only concerned with the maximisation of returns, and disregards any other macroeconomic (environmental, personal, social) disruptions that may bring about consequences to investors (Markowitz, 1952:75-77; Osimore *et al.*, 2012:23).

The notion of diversification for eliminating unsystematic risk is a good advantage of the modern portfolio theory; however, it gives way for an increase in systematic risk. This is brought about by investment portfolios managers' lack of looking into the fundamentals of the assets which they invest in, and only looking into the maximisation of returns and the elimination of the unsystematic risk that may arise (Chandra, 2003). However, regardless of the shortcomings of this theory, it still remains accepted and widely used throughout the academic and research fraternities today.

#### **2.2.5.2 The life cycle of investment theory**

The traditional theory of the life cycle of investing assumes that each individual, or investor, will go through numerous stages of investing consisting of the accumulation phase, consolidation phase, spending phase and finally the gifting phase, in order to accumulate wealth (Modigliani & Miller, 1958). The accumulation phase consists of individuals between the early ages of the 20s to the late stages of the 30s, who are just starting out in their working careers and their main short-term monetary focus falls on car and house instalments, as well as on the cost of marriage, with long-term spending being focussed towards retirement and the payment of children's university fees. The consolidation phase is one in which the middle age group lies in, that is between the ages of 40-50. In this phase, individuals have accumulated enough assets to spend primarily on children's tuition fees and other college/university needs, as well as on taking family vacations, while the long-term spending is more focussed on their retirement needs (Modigliani & Miller, 1958).

The spending phase can be described as the stage where individuals have reached their retirement and have accumulated more than enough income and capital from the first two stages to live on. The last stage, the spending phase, is the stage where individuals have accumulated more than enough monetary assets to sustain the last few years of their lives; therefore, individuals tend to pass down their assets to either their children or to charity (Bodie *et al.*, 1992).

Finally the theory assumes that an individual's investment goals and needs changes as an individual moves from one age group to another, suggesting that when in the early stages individuals invest more in risky assets, but individuals tend to eliminate risky assets as they grow older (Bodie *et al.*,2007). This is due to the fact that the higher the risk the higher the return. Meaning that during the earlier stages of younger investors, these investors are more interested in gaining higher returns, and are not afraid of getting such returns at the cost of increased risks.

### **2.2.5.3 The accelerator model of investment**

The Accelerator model of investment is an investment theory that is based on the assumption that investment is consistent, or relative to the change in the rate of output in a country (Agarwal, 2010:139). This means that decisions made on investing in a particular firm, in any country, are based on a country's ability to maintain a certain level of output that is proportional to the rate of investment. This theory states that investment prospects are not in any way influenced by the actual cost of capital (Agarwal, 2010:139). The model assumes that if the change in the rate of output increases, then the level of investment in the economy will also be on the increase (Gillespie, 2014:370). Technology, based on this theory, needs to be held at a constant rate in order for the theory to hold (Samuelson, 1939:75-78).

For example, if the rate of output increases by a constant rate of R2 million each year, then the net investment will have to increase by R4 million to produce at a higher level. However, if the rate of output increases to R2 million in 2010, then increases to R4 million in 2011, and to R6 million in 2012, then firms will have to increase the level of investment to R4 million in 2010, then to R8 million in 2011, and then finally to R12 million in the year of 2012.

However, similarly a decline in the rate of output in the country will then lead to a slower rate of investment in the economy (Economics Help, 2015). Any fall in the rate of output will also result in a fall in the prospects of investments, thus having a slow and negative effect on the long-term growth of the country (Gillespie, 2014:371). Thus, an increase in investment requires a proportional increase in output.

The model assumes the following formula:

$$\text{Net Investment} = \alpha * \text{Change in the rate of output} \quad (2.1)$$

Where:

$\alpha$  is the accelerator coefficient. The accelerator coefficient is defined as the ratio of the change in capital investment relative to the change in consumer spending (Dictionary.com, 2015).

### **Drawbacks of the accelerator model of investment (Guru, 2015; Gillespie, 2014:371):**

- The main assumption of the model, that is investment will always increase proportionally to the increase in the change of the rate of output, is not entirely true. This is due to the fact that some machinery that has been in the production line may not be made use of, thus such machinery should be integrated and used instead of investing in new machinery.
- Some firms may have a surplus of productive capacity; therefore an increase in investment will not be necessary in order to be consistent with the increase in demand and output.
- Also, in the capital goods markets, there may be restraints or limitations in these markets which may prevent, or hinder the process of increasing investments to be consistent with the change in the rate of output. Such limitations, in South Africa may include social unrests as a result of disagreements between capital goods market employers, employees and trade unions. Reaching deadlocks in terms of employee benefit packages is a limitation to the capital goods market in South Africa, which has had an effect on both the rate of productivity and the level of investment in the country.

To conclude, the accelerator model of investment shows the relationship between the level of investment and the rate of growth of demand in an economy, with the achievement of an increase in net investment being attainable through the acceleration of demand in the economy (Gillespie, 2014:371).

### **2.3 Conceptualisation of exchange rates**

The exchange of goods and services all over the world are able to be conducted through the use of exchange rates, as a method of payment. Exchange rates are also a critical and fundamental part in the entering of investment transactions the world over. The world economy does not comprise of the use of a single currency, but rather most countries make use of their own currencies, which is the reason for the importance of understanding the role that exchange rates play in the world economy (Van der Merwe & Mollentze, 2012:116).

This sub-section focuses on providing the fundamental principles of exchange rates, with the main focus being on the definition of exchange rates, the types of exchange rates, and the theoretical explanations of exchange rates that have been chosen for the purpose of this study.

### **2.3.1 Definition of exchange rates**

An exchange rate is referred to as the rate at which one currency is converted into another (Mpofu *et al*, 2013:80). It is important for the exchange rate to be defined, especially in investment management, because investors buy or sell foreign currency in order to make investments in the desired country (Van der Merwe & Mollentze, 2012:117) Therefore, it is imperative for the types of exchange rates and the movements of such exchange rates to be understood in order to make informed investment decisions.

The quoting of exchange rates is another important element in understanding the concept of exchange rates. There are two methods of quoting of exchange rates in the international financial markets, namely direct quoting and indirect quoting, with all quoted exchange rates being nominal bilateral exchange rates, instead of real effective exchange rates (Star Fish FX, 2015).

- **Direct quoting of exchange rates** – Direct quotation refers to the exact amount of local currency that is exchanged for a single unit of a foreign currency (SARB, 2015).
- **Indirect quoting of exchange rates** – Indirect quotation is defined as the method in which a domestic exchange rate is expressed as a foreign currency, in order to determine the amount of foreign currency that is required to purchase a single unit of the domestic currency (SARB, 2015).

Another important distinction that needs to be considered when exchange rates are being discussed is between spot exchange rates and forward exchange rates, as well as the bid and ask prices (Boundless, 2015).

- **Spot exchange rates** – A spot exchange rate is one in which a foreign exchange is bought and is sold immediately (SARB, 2015).
- **Forward exchange rates** – Forward exchange rates are the exchange rates in which foreign currency is bought and sold but the delivery of the foreign currency occurs at some time in the future, not immediately (SARB, 2015).

- **Bid price** – The bid price is defined as the amount of the quoted currency that will be obtained by selling a single unit of the base currency (FXDD, 2015).
- **Ask price** – The ask price is the amount that has been asked to be paid for in the quoted currency, in order to obtain a unit of the base currency (FXDD, 2015).

The exchange rate operates in a system known as the ‘the foreign-exchange market’, which is a system whereby a country’s currency is exchanged for a currency of another country (Van der Merwe & Mollentze, 2012:117).

According to Van der Merwe & Mollentze (2012:117) there exist four main levels of participants in the foreign-exchange market:

- The first level relates to the investors, importers, exporters, tourists as well as all other participants that make use of the exchange rate as a means of making payments in a transaction.
- The second level of participants comprises to the financial institutions, more especially banks, who act as the intermediary between the earners and users of the foreign exchange.
- The third level of participants includes the foreign-exchange brokers, who together with the banks create a wholesale market. This market is formed in order to assist banks in squaring off their position in the foreign-exchange market.
- Finally, the fourth level of participants comprises of the central bank of a country. The central bank acts as a last resort in the market in the event of balance of payments surplus or deficit. In this case, the central bank would buy or sell foreign-exchange in order to reach balance of payments equilibrium. The central bank also plays an active part in the management of the foreign-exchange market, with the extent of management varying from country to country depending on the exchange rate regime in use.

### **2.3.2 Types of exchange rates**

There exist a number of exchange rates which are being used in the world. This sub-section aims to provide the different types of exchange rates in existence, namely the nominal exchange rate; the real exchange rate; the bilateral exchange rate; and the multilateral exchange rate.

- **Nominal exchange rate** - Nominal exchange rates can be defined as the rates, actual rates, which are charged in the foreign-exchange market (Van der Merwe & Mollentze, 2012:118). These exchange rates reflect the exact amount of domestic currency that is needed in order to be exchanged for foreign currency (About Education, 2015). The nominal exchange rate is the unadjusted weighted average value of a domestic currency relative to all the other currencies that have been pooled together in a single index (Investopedia, 2015).
- **Real exchange rate** - Real exchange rates can be described as the type of exchange rates which indicates the differences in prices between two commodities that are being traded (Van der Merwe & Mollentze, 2012:119). These rates are measured by making use of price indices, which then reflects relative price differences from a chosen base period (Van der Merwe & Mollentze, 2012:119). The real exchange rate is the nominal exchange rate that has been adjusted for inflation (SARB, 2015; Catao, 2007:47).
- **Bilateral exchange rate** - Bilateral exchange rates relate to the rates which are traded solely between two countries (Piana, 2001). These exchange rates are used in the transaction between two countries' currencies, in the financial markets or in banking transactions, where the central bank acts as one part of the transaction (Piana, 2001).
- **Multilateral exchange rate** - Multilateral exchange rates refer to the types of rates which are traded between multiple countries (Piana, 2001). These exchange rates are typically computed by taking a basket of numerous different currencies, selecting a set of relative weights and then computing the most effective exchange rate for a country's currency (Piana, 2001).

### 2.3.3 Theoretical explanations of exchange rates

There exist a number of theories that provide explanations about the determination of the exchange rate, but for the purpose of this study only four of those theories will be focussed on. These four theories were chosen for this study because these theories are widely used in the finance and investment environment throughout the world, and the findings of these theories are still regarded to be relevant till this present day. The theories are the purchasing power parity theory, the interest rate parity theory, the portfolio balance approach to

exchange rates, the monetary approach to exchange rates, as well as the Balassa-Samuelson model.

### 2.3.3.1 The purchasing power parity

The purchasing power parity is a theory based on the determination of exchange rates. This theory was formalised by Spanish scholars during the sixteenth century, and is based on the assumption that identical products should be sold at the same price after two currencies have been converted into a common currency (Van der Merwe & Mollentze, 2012:125). This assumption is because of the arbitrage process. Arbitrage in this context means that the demand for a product with a low price will increase as the demand for the same product with a higher price will decrease until the prices of the products are exactly the same (Dornbusch, 1985:1). The theory also states that exchange rate changes between two currencies are exactly equal to the ratio of the price levels in the two currencies (Dornbusch, 1985:1; Rogoff, 1996:647). This theory uses the absolute and relative purchasing power parities to explain the exchange rate. The differences between these two parities are explained in more detail below.

- **Absolute purchasing power parity**

The absolute purchasing power parity hypothesis can be explained by means of an equation:

$$E = \frac{P^*}{P} \quad (2.2)$$

Where:

E is the equilibrium exchange rate. P\* denotes the domestic price level, and P is the price level in the foreign country.

The absolute purchasing power parity denotes that the real exchange rate is equal to 1, because:

$$E * \frac{P^*}{P} = \frac{P}{P^*} * \frac{P^*}{P} = 1 \quad (2.3)$$

This theory may be applicable in the long-run; however, in the short-run this is not practically feasible (Van der Merwe, 2012:125-126). In the event where the exchange rate is over the value of the purchasing power parity of 1, then the currency in question is considered as

being overvalued; while when the exchange rate is below the value of the purchasing power parity of 1, then the concerned currency is regarded as being undervalued (Van der Merwe & Mollentze, 2012:126).

Aside from the critic that the absolute purchasing power parity is not feasible in the short-run, there is also the added disadvantages of the theory not taking costs, such as transportation costs, tariffs and any other obstructions to the flow of goods and services into consideration (Van der Merwe & Mollentze, 2012:126). Furthermore, the theory only takes into consideration current account transactions, and disregards financial flows which are also just as important. There is also the fact that the arbitrage cannot always be achieved, due to the price levels of the two concerned countries could be based on different types of goods. This is because there are a number of non-traded goods included in the price index, of which some may not be able to be equated with international trade (Van der Merwe & Mollentze, 2012:126). The availability of data is also a problem when it comes to the absolute purchasing power parity theory.

- **Relative purchasing power parity**

In light of all of the disadvantages of the absolute purchasing power parity, the relative purchasing power parity theory was then introduced. This theory differs from the absolute purchasing power parity in the sense that the relative purchasing power parity states that the exchange rate change between two currencies has to be equal to the inflation differences of the two concerned countries, over a specified period of time (Van der Merwe & Mollentze, 2012:126). This can be explained in the below equation:

$$\Delta E = \pi - \pi^* \quad (2.4)$$

Where:

$\Delta E$  denotes the change in the exchange rate between the two concerned countries,  $\pi$  denotes the domestic country's inflation rate, and  $\pi^*$  is the inflation rate of the foreign country.

The adjustment in the relative purchasing power parity theory, from the absolute purchasing power parity theory, is that it is not affected by aggregates such as transportation costs and tariffs, but it is rather affected by the changes in these aggregates (Rogoff, 1996:654). Balassa (1964:586) and Samuelson (1964) asserts that the relative purchasing power parity tends to

only predict overvalued exchange rates for the more developed world, while predicting undervalued exchange rates for their poorer counterparts. This is because of the ratio of the prices of non-traded goods to the prices of traded goods tends to be of a higher value in the developed world than in the developing world. This price differentiation is because the salaries and wages of non-traded goods keeps the same pace as the wages of traded goods, and not the productivity of labour (Van der Merwe & Mollentze, 2012:127). The greater the labour differentials of the production of traded goods, the greater the gap in wages and services (Balassa, 1964:586).

Finally, the purchasing power parity theory to exchange rates tends to hold in the long-run because of the convertibility of the currencies of the concerned countries. However, the theory does not hold in the short-run due to the presence of arbitrage imperfection, which cannot be relied upon during times of exchange rate movements within the level of one price (Levich, 1983:32).

### **2.3.3.2 The interest rate parity**

Another theory of exchange rates determination is related of the return on investment and it is known as the interest rate parity. The interest rate parity theory of exchange rates is based on the assumption that there is an interaction between a domestic country's spot exchange rate and the future rate of currencies (Forex Karma, 2013). This theory assumes that when an investor makes fixed investments in two different currencies then the return expected on both the investments will be the same, even though interest rates may differ in absolute terms (Farlex, 2015).

This theory states that differences in interest rates between currencies will be reflected in the discounted forward exchange rate on the foreign currency only if there is no activity of buying shares in one financial market and selling those shares in another different financial market (Forex Karma, 2013). There is also the assumption that the currency with the lowest rate of interest between the two currencies should be the one with a forward premium against the currency with the highest rate of interest (Prasad, 2011:18). This theory is divided into two sub-sections, namely the covered interest rate parity and the uncovered interest rate parity.

- **Covered interest rate parity**

The covered interest rate parity can be defined as a situation whereby rates of interest are equalised in asset denominated in two different currencies in the foreign exchange market which should be zero. This is done in order to provide investors with the guarantee of a certain level of returns in a domestic currency (Held *et al.*, 1999:217; Aggarwal, 2013:3).

This theory is based on the assumption that the uncovered interest rate parity fails when there is investment without any form of cover; when investors are regarded to be risk-averse, and fails also when investors have a neutral attitude towards risk (Pippenger, 2012:1). This means that the covered interest rate parity theory came into existence because of the shortcomings that were identified in the uncovered interest rate parity.

This theory of exchange rate determination also states that the uncovered interest rate parity theory only holds in the event where there is a risk premium and when investors are opposed to taking risks or only allow a certain level of risk in their investments (Pippenger, 2012:1).

The covered interest rate parity theory can be explained by the following equation:

$$r_t = r_t^* + f_t + s_t \quad (2.5)$$

Where:

$r_t$  is the interest rate of domestic country,  $r_t^*$  is the interest rate of the foreign country,  $f_t$  is the forward exchange rate, and  $S_t$  is the spot exchange rate that is currently in the market.

Equation 2.5 means that when exchange rate risk is avoided, by making use of forward contracts, then yields from investments as well as the costs of borrowing between currencies will yield no difference (Levi, 2009:17). However, there are differences in investment yields and borrowing costs, thus the theory states that it is important to consider the currency in which investment is to take place (Levi, 2009:18).

- **Uncovered interest rate parity**

The uncovered interest rate parity, on the other hand, can be defined as a situation whereby rates of interest are equalised in assets that are denominated in different currencies, and these assets should be equal to one without making use of the selling of forward contracts (Rajid,

2003:3). This means that the future expected performance of the exchange rate between the two different currencies will result in the returns of the asset to be equalised over the maturity of the asset.

The uncovered interest rate parity agrees with the proponents of the purchasing power parity in that both these theories believe in the equalisation of real return rates (Wu & Chen, 1998:838). However, this theory of exchange rate determination tends to fail because it is believed that investing without any form of cover is not only risky to investors, but also because investors are usually risk-averse individuals (Pippenger, 2012:1).

The uncovered interest rate parity theory of exchange rate determination can further be explained by the following equation:

$$f_t = E (s_t + 1) + E + 1 \quad (2.6)$$

Where:

$f_t$  is the forward exchange rate,  $E (s_t + 1)$  is the expected exchange rate, and  $E + 1$  is the forecasted error term. This equation tells us that the forward exchange rate incorporate expectations about the future spot exchange rates. If the forward exchange rate is equal to the expected future spot rate, then the forward premium is also the expected change in the exchange rate (Rajid, 2003:3). In this instance the uncovered interest rate parity is said to hold (Rajid, 2003:3).

With regards to investments, the uncovered interest rate parity believes that when an investor borrows money from a country with low interest rate, then converts and invests the borrowed money in a country with a higher rate of interest, the investor is thought to be in a more financially favourable position (Rajid, 2003:3). This is because when the investor decides to convert the invested currency back to the borrowed currency, the investor gets to be in a position where the investor is able to earn the exact amount as the borrowed, due to movements in the exchange rate (Rajid, 2003:3-4).

Finally, the interest rate parity theory of exchange rate determination is a theory which states that high rates of interest of a currency should be offset by discounts on forward contracts, and the currency with lower rates of interest should be offset by forward premiums (Prasad, 2011:21).

### 2.3.3.3 The portfolio balance approach

The portfolio balance approach to the determination of the exchange rate is a theory that focuses on the notion that the exchange rate is not simply determined by the market forces of supply and demand, but this theory also takes into consideration the supply and demand for financial assets in each individual country (Van der Merwe & Mollentze, 2012:133).

According to Wang (2009:216), the portfolio approach to the determination of exchange rates is attributed to the academic works of Branson (1972, 1976), McKinnon (1969) and Dornbusch (1975). There have been different variants of this theory that have been introduced into the academic environment throughout the years, however, the main and most important assumption that all these theories make is that the wealth that is accumulated by households and is allocated amongst different assets, which includes money as well as both domestic and foreign assets. Households will have to decide on which holdings, between domestic and foreign assets, to hold in their investment decision, because domestic bonds and foreign bonds are said to be imperfect substitutes in this theory (Husted & Melvin, 2007:455; Van der Merwe & Mollentze, 2012:133). This assumption can be explained by the use of the following equation:

$$W = M + B + EB^* \quad (2.7)$$

Where:

$W$  denotes the wealth that a household accumulates;  $M$  denotes money;  $B$  refers to domestic assets, and  $EB^*$  denotes the domestic currency in terms of its exchange value x foreign assets.

According to the portfolio balance approach to the determination of exchange rates the opportunity cost of holding money is the direct yield lost on holding other financial assets, including domestic and foreign assets (Van der Merwe & Mollentze, 2012:133). Furthermore, the theory assumes that financial assets, which are made up of domestic and foreign assets, are imperfect substitutes due to investors' perception that foreign exchange rate risk is directly linked to foreign assets, but the holding of foreign assets has the advantage of spreading expected risk amongst different financial markets (Husted & Melvin, 2007:455; Van der Merwe & Mollentze, 2012:133). It is essential to note that during a household's investment portfolio decision-making process a number of variables need to be considered, as

well as the short-run or long-run changes of these variables, because the changes of these variables may have an effect on the ultimate composition of the household's investment portfolio, and thus the degree of satisfaction to the household (Van der Merwe & Mollentze (2012:133). The variables that can affect a household's investment portfolio includes variables such as inflation, the price level, both domestic and foreign interest rates, returns made on domestic and foreign investments, as well as changes in wealth.

The portfolio balance approach to the determination of exchange rates states that the exchange rate can be explained making use of the following equation:

$$E = \frac{(W-M-B)}{B^*} \quad (2.8)$$

Where:

$E$  is the domestic currency's exchange value;  $W$  denotes wealth,  $M$  denotes money,  $B$  denotes domestic assets, and  $B^*$  denotes foreign assets.

The role that the exchange rate plays in the portfolio balance approach is one of which provides a balancing act between the demand of assets and the supply of assets. This balancing act means that a decrease in the supply of domestic money, with all other variables held constant, results from an increase in domestic interest rates (Van der Merwe & Mollentze, 2012:134). This increase in domestic interest rates will lead to an increase in holdings of domestic assets, thus leading to a decline of households' holdings of foreign assets. The added increase in domestic assets' holdings will ultimately lead to the appreciation of the domestic currency (Van der Merwe & Mollentze, 2012:134).

Similarly, if there is a decrease in the supply of foreign money, with all other variables held constant, then this means that there has been an increase in foreign interest rates, thus this will most probably lead to a greater desire to increase holdings of foreign assets and a lesser desire to have holdings of domestic assets. The increase in the holdings of foreign assets and the decline of holdings of domestic assets will have a negative impact on the domestic country's currency, leading to a depreciation of the currency (Van der Merwe & Mollentze, 2012:134). This relationship between interest rates and assets, which are also known as investments, are the key link between exchange rates and investment according to the portfolio balance approach.

Finally, the portfolio balance approach to the determination of exchange rates differs from the other theories of the determination of exchange rates in the sense that it takes into consideration the changes in financial flows, which contributes to changes in exchange rates (Van der Merwe & Mollentze, 2012:134).

#### **2.3.3.4 The monetary approach**

Another approach that explains the determination of exchange rate is the monetary approach. The monetary approach to the determination of exchange rates is a theory which was developed by the Robert Mundell and H. G. Johnson in the years between 1960 – 1970 (Van der Merwe & Mollentze, 2012:131). According to this theory, the exchange rate is said to be determined by the demand and supply of money between two countries. This theory differs from that of the portfolio balance approach to exchange rates in the sense that the monetary approach to exchange rates states that domestic bonds and foreign bonds are perfectly substitutable to each other, whereas the portfolio balance approach to exchange rates assumes these two variables to be imperfect substitutes (Husted & Melvin, 2007).

Furthermore, this exchange rate theory assumes that there is a linkage between the demand for money and the level of national income. This relationship is assumed to be positive and stable in the long-run, and also that the conditions of the absolute purchasing power parity hold in the long run. This can be explained by making use of equations 2.9, 2.10 and 2.11 below (Van der Merwe & Mollentze, 2012:131):

$$M_d = kPY \quad (2.9)$$

Where:

$M_d$  is the total money demanded;  $k$  denotes the relationship between the demand for money and the level of national income;  $P$  denotes the domestic price level, and  $Y$  represents the real output in the country.

The total money supplied in the country can be represented by the following equation:

$$M_s = m (DC + F) \quad (2.10)$$

Where:

$M_s$  is the total money supplied in the country;  $m$  is the money multiplier; DC represents the domestic component of the monetary base, and F denotes the country's foreign exchange reserves.

The two above equations represents the quantity of money demanded and money supplied in the country, and the monetary approach to exchange rate determination assumes a monetary-equilibrium condition where money demanded and the money supplied is equal. This relationship can further be explained by the following equation:

$$m (DC + F) = kPY \quad (2.11)$$

According to Frankel (1984:239), the monetary approach to exchange rate determination has two versions to it. There is the version that assumes that there are perfectly flexible goods prices in the market, and there also exists a version which suggests that there are sticky goods prices in the market.

- **The flexible goods price monetary model**

According to Frankel (1984:240-241) the flexible goods price monetary model is attributed to the academic work of Frenkel (1976), Bilson (1978) and Mussa (1976). This model is based on the assumption that the prices of goods are perfectly flexible in both the short-run and in the long-run. This means that the purchasing power parity, which states that products should sell for the same price as long as there is the possibility of conversing two currencies into a common currency due to the process of arbitrage, holds not only in the long-run but in the short-run as well. The flexible goods price holds in the long-run because it is assumed that adjustments to long-run equilibrium can be made instantaneously (Frankel, 1984:241). The equation of the model is as follows:

$$s = p - p^* \quad (2.12)$$

Where:

$s$  is the price of foreign currency in terms of the domestic currency, it is also defined as being the spot exchange rate;  $p$  is the price level of the domestic currency; and  $p^*$  is the price level of the foreign currency.

- **The sticky goods price monetary model**

The sticky goods price monetary model is the academic works of Dornbusch (1976), and is based on the assumption that the price of goods in the market are not perfectly flexible in the short-run, instead the purchasing power parity can only hold in the long-run (Frankel, 1984:241). The model's equation is given below:

$$\bar{s} = \bar{p} - \bar{p}^* \quad (2.13)$$

Where:

$\bar{s}$  is the long-run equilibrium price of foreign currency in terms of the domestic currency, which is also known as the spot exchange rate;  $\bar{p}$  is the long-run equilibrium price level of the domestic currency; and  $\bar{p}^*$  denotes the long-run equilibrium price level of the foreign currency.

Finally, the monetary approach to exchange rate determination is a theory that states that the demand for money plays a crucial role in the process and determination of exchange rate levels (Van Marrewijk, 2005:26). However, the reason for the purchasing power parity not being able to hold in the short-run is because the exchange rate can deviate from its equilibrium level, but the market expects the exchange rate to fix itself and regress towards the equilibrium in the long-run (Frankel, 1984:241).

The monetary approach to the determination of exchange rates aims to explain the link between exchange rates and investments by showing that the effective exchange rate is not affected by changes in outstanding debt or finances into the country by foreign investors in the long-run, but rather in the short-run (Wilson, 2009:96). This is mainly because the tendency of currency depreciation tends to lead to a detrimental effect on a country's ability to maintain monetary stability, as well as the flow of international goods and services and investments, most especially foreign direct investments (Jimoh, 2004:109).

### **2.3.3.5 The Balassa-Samuelson model**

The Balassa-Samuelson Model is a model which was derived from the publication of two articles in international economics, namely The Purchasing Power Parity Doctrine: A Reappraisal by Bela Balassa and Theoretical Notes on Trade Problems by Paul Samuelson.

These two articles provide the framework for the link between the purchasing power parity theory, exchange rates and inter-country real income comparisons (Asea & Corden, 1994:2).

This model is based on the assumption that the purchasing power parity is flawed as an exchange rate determination theory in its regard to the assumption that relative prices of a basket of goods with two different currencies will eventually be equal when the two currencies are converged into the same currency, meaning that the real exchange rates will be equal to 1 (Cassel, 1918:413-415). However, Balassa and Samuelson argued that the greater the labour differentials of the production of traded goods, the greater the gap in wages and services, which is a direct result of the differences in technological advancements between high-income countries and low-income countries. Therefore, this then results in low-income countries having lower domestic prices as opposed to high-income countries, when the exchange rates of the two concerned countries have been converted into one currency. This is in direct conflict with the assumption of the purchasing power parity theory, which states that when two currencies have been converted into the same currency then this will result in unbiased inter-country real income comparison (Asea & Corden, 1994:3).

The Balassa-Samuelson model can be further explained making use of the below equation:

$$q = e + p - p^* \quad (2.14)$$

Where:

$q$  is the real exchange rate;  $e$  is regarded as the nominal exchange rate;  $p$  denotes the final demand price growth in the domestic country; and  $p^*$  denotes the final demand price growth in the foreign country.

## 2.4 Empirical literature

This section of the study aims to provide the empirical literature that has been researched throughout the years that confirms that there is a relationship between exchange rates and investments.

A number of studies have been conducted with the focus being on the impact that exchange rates fluctuations have on investments (Darby *et al.*, 1999; Giovannini, 1988; Goldberg, 1993; Hooper & Kohlhagen, 1978). Since investors, corporations and governments in many countries do not have any control over the performance, or changes in exchange rates, the

empirical literature of this study will analyse the effects of such exchange rate movements on investments. Exchange rate movements can have an indirect effect on investments in that exchange rates influence the international price of goods and services, which in turn has an effect on the international trade of such goods and services across all global borders (Campa & Goldberg, 1999).

Fluctuations in exchange rates have two opposing effects on the economy and the overall future prospects of investment. When a currency appreciates, imports become relatively cheaper as opposed to exported goods and services, and the marginal profit of investing one additional unit of capital is more likely to decrease due to the lower revenue generated by domestic firms operating both locally and in foreign lands (Harchaoui *et al.*, 2005:1). Darby *et al.* (1999) found evidence that uncertainty regarding exchange rates can, in the long-run, have a significantly negative effect on investment. This means that when there exists uncertainty from investors regarding the performance and the ability of a country's currency to appreciate in the long-run, then investors tend to move their investment from the country to markets which are perceived to be more stable, and have an open and healthy investment environment (Destiny Connect, 2015).

Several studies (Campa, 1993; Schmidt & Broll, 2009; Waldkirch, 2003) found that an appreciation of a domestic currency has the tendency to attract more foreign direct investment. In each study, there was found to be a positive relationship between the appreciation of the real exchange rate and foreign direct investment flows. Campa (1993) found that when an appreciation of a domestic currency occurs then capital flows in the country also increases, which then increases productivity of firms operating in the domestic country. These findings are in line with the findings of Schmidt & Broll (2009), who found that the appreciation of a domestic currency had a positively-aligned relationship with foreign direct investment flows in a domestic country. Waldkirch (2003) conducted a study on foreign direct investment flows into Mexico, and found that when an appreciation of the Mexican currency occurred then there would be an increase in the foreign direct investment inflows that get pumped into the Mexican economy.

With regards to capital inflows into South Africa, the trend of high capital outflows have been reversed with a high level of capital inflows during the 1990s (Wesso, 2001:60). South Africa's capital inflows consist of foreign direct investment which includes investment in a firm by foreign investors; portfolio investment which consists of the sale and buying of

equities and bonds in capital markets, as well as other foreign investments which include foreign deposits and loans between financial institutions, government and non-financial businesses (Wesso, 2001:60).

South Africa has attracted relatively small levels of foreign direct investment as opposed to portfolio investment over the years (SARB, 2008:27). This is mainly because portfolio investors are able to hedge against currency risk, which makes it easier to attract investors with a high risk tolerance as well as speculators, leading to an increase in portfolio investments (Zhang, 2009:76).

During a period of a depreciation of the local currency, exports become cheaper which leads to higher revenue made by domestic firms, while imports become more expensive. This leads to the marginal propensity of investing one additional unit of capital increasing, caused by the higher revenue generated. This often tends to lead to an increase in investment spending (Harchaoui *et al.*, 2005:1).

Campa and Goldberg (1999) studied the relationship between exchange rates and investment, making use of industry level data. Their study yielded results that concluded that a depreciation of a domestic currency has a positive effect on the investment capacity of a particular country, as more revenue will be pumped into the economy, and the opposite occurs when there is a currency appreciation. It was also found that firms, which have little monopolistic power in the economy, will be more prone and sensitive to exchange rate fluctuations, thus affecting the investment decisions made by the particular firms.

Studies conducted by Giovannini (1988) and Hooper and Kohlhagen (1978) have found that exchange rate fluctuations affects investment indirectly as they have an influence on the domestic and international trade of goods and services, as well as having an influence on the prices of such goods and services. It was also found in these studies that there exists a relationship between exchange rates and domestic and international trade, because exchange rates affect the cost of production, capital and the location in which investment is directed towards. They concluded that the exchange rate risk that exists for all firms operating domestically and internationally has a positive effect on the prices if exporters are willing to bear the risk, and a negative effect on prices on importers if they are willing to bear the exchange rate risk.

Goldberg (1993) argues that exchange rate fluctuations causes abnormal behaviour in the relative prices of input and output products for enterprises, and on their profitability. Goldberg also found that exchange rate variations influence investment differently. Firstly, the profitability of firms will be adjusted due to exchange rate movements which are caused by the effect of exogenous demand for goods and services. Movements in exchange rates will lead to the abnormality of the international trade of goods and services, which have a direct effect on the relation that exists between the demand for exported and imported goods and services. The depreciation of a domestic currency is often regarded as an incentive for investment, as it will generate higher demand for exported goods, due to their lower prices, and thus lead to higher revenue for domestic firms, eventually leading to higher revenue for the economy (Gomez, 2000:4). Secondly, changes in the level of exchange rates will have locational effects on investment. Such exchange rate changes do not only affect the profitability of firms within particular sectors of a country, but also has an effect within different countries, leading to a reallocation of capital.

According to Gomez (2000:6) multinational firms will be affected by exchange rate variations in two main ways. Firstly, the possible complementary production of multinational firms among countries will be affected, and secondly there will be limited finances available to these multinational firms, and there will be restrictions of funds generated from within the firm to support in the investment of different plantations internationally.

Finally, perhaps the most important argument set forth by Goldberg is the argument associated with the effect that exchange rate variations have on investment is its influence on the portfolio and the wealth of domestic and international investors. Goldberg (1993) argues that changes in exchange rates affects international investors' wealth and can provide incentives for investments in domestic or foreign countries. This, however, depends heavily on the relationship towards investors' perceived preferences and perceptions for domestic or foreign investment and financial assets, as well as their personal perception of the domestic or foreign risk- return relationship that may be in existence (Gomez, 2000:6).

## **2.5 Summary**

This chapter presented the literature review with the aim of explaining the interaction between exchange rates and investment. The literature review was divided into three sub-

sections, namely the conceptualisation of investments, conceptualisation of exchange rates and the empirical literature.

The conceptualisation of investments focussed on definitions of investments, including the types of investments, basic concepts of investments, as well as the reasons for investments. The theories of investments were also included in this section, with the main theories being the modern portfolio theory, the life cycle of investment theory and the accelerator model of investment.

The second sub-section of this chapter concentrated on the conceptualisation of exchange rates, which included descriptions of the definition of exchange rates, the types of exchange rates with the main focus being on the fixed exchange rate and the free-floating exchange rate. The theoretical explanations of exchange rates included the purchasing power parity theory, the interest rate parity theory, the portfolio balance approach to exchange rates, the monetary approach to exchange rates and the Balasso-Samuelson model.

The third part of the chapter included previous empirical literature which was conducted by researchers on the relationship between exchange rates and investments in different parts of the world. The studies that were analysed showed that there are conflicting results when coming to determining the relationship between exchange rates and investments. However, several studies conducted showed that there does exist a relationship between exchange rates and investments, with most proving that exchange rates have a long-run negative effect on investment, meaning that a depreciation of exchange rates will result in a decrease in investments.

## **CHAPTER THREE: EXCHANGE RATE REGIMES AND DIFFERENT TYPES OF INVESTMENTS IN SOUTH AFRICA**

### **3.1 Introduction**

The choice of an appropriate exchange rate regime is essential for a country because it provides a basis for a country to become competitive in the world economy, and also because it prevents a country from entering into a currency crisis, to maintain macroeconomic stability as well as growth, especially in the case of developing countries such as South Africa (Yagci, 2001:4). It is of utmost importance for a country to look backwards at the types of exchange rate regimes that have been used in the past in order to evaluate what had happened and if it were a success or a failure, in order to evaluate the type of exchange rate regime to prescribe to in the future ahead.

Therefore, it is important that this study provided a background of the exchange rate regimes that the South African currency has been accustomed to, which is the aim of this chapter.

This chapter proceeds with the general explanation of the different types of exchange rate regimes, in Section 3.2. Section 3.3 provides the historical review of exchange rate regimes in South Africa. Section 3.4 then proceeds to provide the trend of different types of investment in South Africa; and lastly Section 3.5 summarises and concludes the chapter.

### **3.2 Different types of exchange rate regimes**

The determination of a country's exchange rate can be left to the market forces of supply and demand, or it can be controlled through monetary policy administration. Monetary policy authorities may decide on a free floating exchange rate regime, which is one where the exchange rate is purely determined by the market forces of supply and demand (Van Der Merwe, 1996:1). On the other end of the spectrum, monetary authorities may decide on a fixed exchange rate regime whereby the exchange rate is kept constant at a specific interest rate level (Van Der Merwe & Mollentze, 2012:278).

According to Van Der Merwe & Mollentze (2012:276) there is no clear cut explanation as to which one of the available exchange rate regimes is more efficient to apply than the other, as all of these systems have advantages and drawbacks attached to them, which are summarised below.

### **3.2.1 Fixed exchange rate regime**

The fixed exchange rate regime is a regime which is usually adopted by monetary authorities to solve the problem of exchange rate uncertainty/high currency volatility, and also to achieve a target for the nominal exchange rate in which monetary authorities intervene in the market in order to achieve this target (De Oliveira, 2014:556). This exchange rate regime is also known as the pegged exchange rate regime. This regime is regarded to be effective in eliminating the problem of exchange rate uncertainty which affects the potential of attracting new investments into a country, and maintaining existing investments, only when monetary authorities have the knowledge, skills and capabilities to maintain it during longer periods of time.

According to Kydland & Prescott (1977) there is the problem of credibility that comes with the use of the fixed exchange rate regime. There is the recognition by economic agents that there might be situations that may require a change in the exchange rate regime, therefore there arises the incentive for monetary authorities to re-evaluate their commitment to the fixed exchange rate. The choice to change from the fixed exchange rate regime may be costly and could lead to huge depreciations in the domestic currency. Thus, it is essential for monetary authorities to maintain consistency with regards to the exchange rate policy which they decide to undertake to solve uncertainty problems (De Oliveira, 2014:560).

#### **Advantages of the fixed exchange rate regime (Van der Merwe & Mollentze, 2012:276):**

- Fixed exchange rates promote price stability due to the existing certainty regarding the prices of imported intermediate goods;
- They enforce discipline to countries to follow responsible financial policies;
- Due to exchange rates being stable, there is greater certainty for the operators of the foreign exchange market; and
- Fixed exchange rates promote international trade because of the price stability, which should result in greater economic growth and prosperity.

#### **Drawbacks of fixed exchange rate regime (Van der Merwe & Mollentze, 2012:276):**

- The main disadvantage of fixed exchange rates is that monetary authorities' main priority is concentrated more towards external balances rather than domestic considerations;

- Fixed exchange rates do not insulate a country against any external shocks; however they provide a certain degree of stability when internal shocks occur;
- With fixed rates, it becomes relatively difficult for monetary authorities to maintain a fixed exchange rate, as well as capital mobility to meet domestic goals; and
- The currency could come under extreme speculative concerns when monetary authorities cannot defend a fixed rate indefinitely.

### **3.2.2 Free-floating exchange rate regime**

Under the free-floating exchange rate regime there is no market intervention from monetary authorities and the exchange rate is allowed to assume any value between zero and infinite (De Oliveira, 2014:556). The free-floating exchange rate regime is accompanied by high exchange rate uncertainty which may result in the reduction of investment inflows into the domestic country (Krugman, 1989).

The free-floating exchange rate is also related to the managed floating exchange rate regime, in the sense that the managed floating exchange rate is the rate in which government allows for the exchange rate to be influenced by the factors of supply and demand. But the managed floating exchange rate regime differs from the free-floating exchange rate in that the monetary authorities may seek to influence the movements of the exchange rate by making use of buying and selling reserves, in order to manage the currency (Grant & Vidler, 2003:196).

#### **Advantages of the free-floating exchange rate regime (Van der Merwe & Mollentze, 2012:276):**

- The balance of payments disequilibrium is corrected by a free floating exchange rate;
- Only one price is needed in order to adjust transactions in the balance of payments, which is less expensive as compared to a system that would require domestic prices to be adjusted as well;
- The effectiveness of monetary policy is enhanced because measures can concentrate on domestic goals; and
- There is a limited cost of intervention needed to be incurred in order to maintain a specific exchange rate level.

**Drawbacks of the free-floating exchange rate regime (Van der Merwe & Mollentze, 2012:276):**

- The uncertainty that is caused by currency speculations and predictions discourage international trade and investment, however hedging operations can be used to be counter-productive to some extent;
- If the demand and supply of imports and exports are highly inelastic, exchange rates will tend to be unstable and extreme exchange rate fluctuations can be experienced;
- The speculation based on expected changes of exchange rates can be destabilising; and
- If there is a lack of financial discipline, there will be large fluctuations in interest rates and exchange rates, resulting in possible significant costs to the country.

**3.3 Historic review of exchange rate regimes in South Africa**

Just like in most countries, the South African exchange rate has gone through a series of changes since the Second World War, which has shaped the speed and manner in which the economy has grown, and on many occasions fluctuated. The section below will go into the different types of exchange rate regimes that the South African economy has gone through throughout the years.

Over the years, there have been changes that have been made in terms of the way in which the monetary policy of the South African currency has been applied. This sub-section divides the exchange rate revolution of the South African rand into six respectable periods. The first period relates to the 1945-1971 period, followed by the 1971-1979 period. Period three is the 1979 – 1985; followed by the exchange rate regime of 1985-1994. Period five is 1994-1995; then finally the exchange rate revolution ends at the period between 1995-present day. These periods are outlined below.

**1945 – 1971 Period**

The World War 2 left the South African economy with a large budget deficit, high inflation rate, and substantial increases in the money supply and bank credit extension, which was a result of the reduction of interest rate by the country's monetary authorities as a measure of counteracting on the increases in international interest rates (Van der Merwe & Mollentze, 2012:301).

These circumstances that were caused by macroeconomic events led to South African monetary authorities having to have greater monetary control and discipline, thus the authorities agreed upon a system of stable but adjustable exchange rates. This means that South Africa, as well as other member countries, had to make sure that their exchange rate fell within a 1% fixed margin rate (Van der Merwe, 1996:1; Van der Merwe & Mollentze, 2012:301). A member country was only allowed to adjust its exchange rate, only with the concurrence of the International Monetary Policy (IMF), above the 1% fixed margin during periods of disequilibrium of a country's balance of payments (Van der Merwe, 1996:2).

According to Van der Merwe & Mollentze (2012:302) the main objectives that the Bretton Woods Arrangement aimed to achieve was to maintain a fixed exchange rate, the management of the demand for money through interest rates, as well as the creation of employment. These objectives were to be achieved by making use of monetary instruments, such as moral suasion, discount policy and exchange control, as measures of credit control.

Moral suasion refers to a monetary technique central banks use to encourage private and commercial banks to extend or limit credit to certain sectors/industries of the economy (Van der Merwe & Mollentze, 2012:247). Discount policy is defined as the actions taken by monetary authorities to create a liquidity shortage which then forces banks to borrow from the central bank at a discounted rate. The exchange rate control instrument refers to the actions of the central bank to manage and control the exchange rate in times of economic and political shocks, which may cause large financial fluctuations that could result in the destabilisation of the economy (Van der Merwe & Mollentze, 2012:135).

These credit controls, which form part of monetary policy, were aimed mainly at commercial banks because these banks were regarded as the only financial institutions that could create and circulate money on a multiple basis (Van der Merwe & Mollentze, 2012:302). South African monetary authorities decided to prioritise money because it was regarded as being essential for increases in expenditure; changes in the money supply have an influence on interest rates which in turn have an effect on the behaviour of households with regards to consumption and investment; there is also the recognition by the monetary authorities of the relationship between the increase in money supply and the availability of credit; and lastly there is also the recognition of monetary authorities of how changes in the money supply can influence households' spending (de Kock, 1981:3).

The Bretton Woods Arrangement was successful in bringing down the inflation rate, increasing the real gross domestic product during the period of 1950 – 1960, as well as reducing the balance of payments deficits in the country's current account to lower levels. However, these economic tribulations were not long-lived due to the political events that occurred during the 1960s (Van der Merwe & Mollentze, 2012:303).

### **1971 – 1979 Period**

The 1971 – 1979 financial period was an exchange rate regime which was characterised by two exchange rate systems, namely the Bretton Woods Arrangement and then the attempts by South African monetary authorities to adopt a pegged exchange rate which was aimed at maintaining a stable exchange rate (Van der Merwe, 1996:1; Van der Merwe & Mollentze, 2012:303-305; Ziramba, 2007:90).

The political interruptions that occurred during the 1960s resulted in large budget deficits, the depletion of foreign reserves, a decline in foreign investors' confidence, as well as a decline in liquidity. Due to these economic problems this led to the disintegration of the Bretton Woods Arrangement, which can also be referred to as the breakdown of the system of fixed exchange rates, which was then followed by the devaluation of the rand (Van der Merwe & Mollentze, 2012:303).

During this period, the monetary authorities' main objectives were the stabilisation of the exchange rate, the creation of employment opportunities, price stability, as well as the management and control of the demand for money (Van der Merwe & Mollentze, 2012:304). The authorities' achievement of these economic objectives were to be achieved through the employment of direct controls on credit and interest rates, which included either increasing interest rates in order to reduce the supply of money in the market and decreases output, or by decreasing interest rates in order to increase the flow of money in the market and raises output (Dornbusch *et al.*, 2011:219).

However, despite all of monetary authorities' attempts to peg the exchange rate to improve the economic status of the South African economy, they were unsuccessful in achieving the objectives of employment creation, price stability as well as the stability and growth of the rand (Van der Merwe & Mollentze, 2012:305). All these failures were the result of the following deficiencies (De Kock Commission, 1984:147):

- The increases in interest rates were not adequately controlled by the system;
- The pegged exchange rate system led to the disintermediation practices being employed, which resulted in money market fluctuations;
- Monetary authorities could not allow interest rates to increase to levels that could be appropriate to achieve more money supply growth and stable growth in the credit extensions of banks;
- The adjustment of the spot exchange rates and the forward exchange rates were not always allowed to be raised to levels that could result in appropriate levels of money demand; and
- There was an enormous amount of reliance on exchange rate controls which was an inefficient manner of rationing the availability of foreign exchange rate and ultimately disrupted the inflow of capital.

### **1979 – 1985 Period**

This financial period was characterised by monetary authorities' efforts to develop the country's foreign exchange market, which was coupled with a free-floating exchange rate system (Van der Merwe, 1996:1). In this period, monetary authorities replaced direct controls as monetary policy measures to control the exchange rate for more market-related monetary policy measures, which were then stated as the approach to achieve the primary monetary policy objectives of high and stable employment levels, a stable price level, stable economic growth, the management of money demand, as well as the equilibrium of the balance of payments coupled with the maintenance of the currency in terms of foreign exchange (De Kock, 1983).

### **1985 – 1994 Period**

The 1985 – 1994 financial period was heavily characterised by socio-economic and socio-political disruptions, as well as financial sanctions being imposed on the country, which hampered the development of the foreign exchange market, and that resulted in monetary authorities having to re-enter the foreign exchange rate market under the direct control monetary policy measures to manage and control the exchange rate, and also to influence the inflow of capital on monetary reserves into the country (Van der Merwe, 1996:1). During this period, monetary authorities' main objectives were not only limited to regulating the inflow of capital on monetary reserves but also the creation of employment, price stability and the management of money demand (Van der Merwe & Mollentze, 2012:309).

During this period, it was publicly announced by monetary authorities that gold mines would only be paid half of their proceeds in US Dollars, and the other half of the proceeds would be paid out in rands. Other exchange rate control measures which were taken included exchange control on capital transfer by non-residents and the gold-mining industry were to be paid only in rands for the gold bullion sold to the Reserve Bank (Van der Merwe, 1996:7). These measures were taken to ensure the effective employment and application of exchange rate control procedures, because there was relative volatility that happened in the financial markets which also reflected in the domestic economy (Van der Merwe, 1996:7; Van der Merwe & Mollentze, 2012:309).

The disintegration of the Bretton Woods System came with the main problem of the exposure of the exchange rate to exchange rate uncertainty and fluctuations, which the South African rand has been accustomed to from the early 1990s (Van der Merwe, 1996:7-8).

### **1994 – 1995 Period**

This period is a significant period in the history of the South African country as it was the period whereby democracy was introduced into the country. During this period the country's international financial sanctions were normalised and steps were taken by the new government to develop a more forward-looking market approach with less central bank involvement, as well as the relaxation of the control of the exchange rate through inflation targeting (Van der Merwe, 1996:1).

In order to achieve the mission of creating a financially conducive environment the following monetary policy objectives were set out by the Reserve Bank, in order to protect the external and internal value of the South African rand (Van der Merwe & Mollentze, 2012:312):

- To develop an infrastructural environment that was financially sound, this included financial markets that were effective enough to facilitate the implementation of monetary and fiscal policy, and financial institutions that provided financial services that are essential for vigorous economic growth by a developing economy;
- To reduce the country's rate of inflation to an inflation rate that is parallel to the average rate of inflation in competitive and partner countries;
- To maintain positive real interest rates;

- To increase the level of gold and foreign exchange reserves to a level that is comfortable and appropriate for the development and growth of the country's economy; and
- To manage and control the money-creating process, in order to ensure that an appropriate, but not an excess or a shortage, amount of new money is supplied into the market.

According to Van der Merwe (1996:8-9) the monetary policy instruments which were used to achieve the above outlined objectives was a market oriented procedure of not targeting the exchange rate but rather allowing for the market forces of demand and supply to determine the current level of the exchange rate. However, allowing the exchange rate to be determined by market forces did not mean that the Reserve Bank could not interfere in the market during periods of short-term fluctuations in the exchange rate. The monetary authorities participated in the buying and selling of foreign exchange in order to stabilise the exchange rate, and also to discourage the outflow of financial assets and capital as a result of non-fundamental factors (Van der Merwe & Mollentze, 2012:313-314).

### **1995 – Present**

The financial period between 1995 to 2000 was the period whereby the South African monetary authorities shifted from a monetary targeting regime to a regime that concentrated on informal inflation targeting, under which the spot exchange rate was allowed to be determined by the market forces of supply and demand and exchange rate controls would only be exercised over residents in terms of capital movements (Sibanda, 2012:27; Van der Merwe & Mollentze, 2012:313). The Reserve Bank did not prescribe to fixed buying and selling rates for dollars to be used by banks when transacting with the general public, neither does the Reserve Bank state its own predetermined rates for buying and selling for spot dollars (Van der Merwe, 1996:9). This allows the currency to be determined by the market forces of supply and demand but the Reserve Bank was allowed to intervene in the market during periods of short-run variability of the exchange rate by making adjustments to the stock level of gold and foreign exchange reserves (Nattrass, 2002). This was a move by monetary authorities to an informal inflation targeting regimes was a move to position South Africa as a growing and competitive economy into the global economy (Aron *et al.*, 1997).

From 2000 till present, the monetary authorities maintained the inflation targeting framework under the free-floating exchange rate, which is believed that in order for inflation targeting to

be effective there should be no pre-commitment to a particular exchange rate target (Mtonga, 2011). Under this regime the Reserve Bank has no control whatsoever on foreign exchange but can still influence the exchange rate by being a participant in the buying and selling of other currencies (SARB, 2012). SARB (2012) also argues that the decisions taken by the Bank should not be taken as the management of the exchange rate but rather the management of international liquidity.

The rand experienced its lowest rate of depreciation in 2001 (Sekantsi, 2009:3). The rand depreciated from R8/US Dollar in June of 2001 down to R12/US Dollar in December the same year (Raddatz, 2008:2). After a trend of downswings during the 1990s, with the strongest downswings attributed to the 1998 Asian financial crisis the rand strengthened to its highest point in 2004, and continued on a stability trend until the financial year of 2006 (Hanival & Maia, 1994:25). This trend was affected adversely during the 2007-2009 world financial crises, with the currency being depreciated by the performance of the world, and investment perceptions moving away from emerging markets and towards the more developed countries (Hanival & Maia, 1994:25-26).

With this exchange rate regime and the interventions taken by the monetary authorities of the country, the currency has remained exposed to fluctuations in the world economy, as well as socio-economic issues within the country. The problem of load-shedding has played a critical role in the depreciation of the rand since 2010, which has continued till the present day. The rand strengthened against the US Dollar during 2010, mainly due to the 2010 FIFA World Cup being hosted in the country, and this trend continued on until 2012 (Trading Economics, 2015).

However, this trend fell in 2014, and analysts had predicted that the rand would remain at the weak position for the next 5 coming years, with attributing factors being the weak performance of the world economy as well as microeconomic issues, such as load-shedding; political instability; and social unrests, affecting the country's investment and economic performance (Mittner, 2014).

The rand has remained at a relatively weak position during the first half of 2015, and hit its weakest point of 13.93/US Dollar in the beginning of September, the lowest point since 2001 (Trading Economics, 2015). The more recent Chinese stock market crash, which has also affected the South African rand, along with other global events, has been a contributing factor

to the decline of the rand (BBC, 2015). The Chinese market crash has put pressure on South Africa because it affects the Chinese' demand for commodity and industrial products exported from South Africa (The Economist, 2015).

The impact of the volatility of the rand has not only been felt in the investment sphere of the economy, but also in other sectors and business areas of the country. Sectors such as the industrial sector and the importing and exporting market have also been prone to exchange rate uncertainty (Sekantsi, 2009:3). Exchange rate uncertainties have potential rippling effects on a country's economic performance, especially for countries that are still heavily dependent on trade and foreign investment as a means of improving its GDP growth, and South Africa has not been exception.

### **3.4 Trend of different types of investments in South Africa**

Investment plays a very pivotal part of any country's economic growth and development, most especially in emerging markets such as South Africa. This is why it is so important that a stable, healthy and attractive investment environment is present so as to attract productive and sustainable foreign and domestic investment into the country (Wentworth, 2012:3). Uncertainty regarding a country's exchange rate tends to have a negative effect on investment and the performance of a country's economy mainly because this uncertainty usually makes investors hesitant to invest immediately, and rather wait for the next investment period to invest, when the economic climate in the country improves (Mpofu, 2013:2).

Both domestic and foreign investments have played an important role in the economic development of South Africa (Arvanitis, 2005:64). During the decade before 1994, South Africa experienced slow investment and economic growth because of political unrests and international sanctions imposed as a measure of opposing and overturning the Apartheid government (Faulkner & Loewald, 2008:4). However, the trend of investment inflows into the country has gone through a series of fluctuations from 1970 till present day, which this sub-section aims to provide an overview of. The trends in domestic and foreign investments in South Africa are outlined below, starting with the trend of domestic investments, and then followed by the trend of foreign investments.

### **3.4.1 Trend of domestic investment in South Africa**

Domestic savings and investments have always been at a lower percentage than foreign investment flows into South Africa, but it still provides an important part of the Gross Domestic Product calculation of the country's economy.

During the period of 1985 – 1994, a relatively high percentage of domestic savings in South Africa were attributed to corporations in the private sector, rather than to individual and household savings (Du Plessis & Smit, 2006:22). Households' savings, during this same period, also showed a relative decline from 3% of GDP in 1985-1994 to a mere 0.8% in 1995-2004. The decline in households' savings in South Africa is the cause of the high disparity of income, slow growth in income and the high level of consumer debt, which made it relatively difficult for households to save and invest a portion of their income (Prinsloo, 2000:18-21).

According to the World Bank (2011:21) domestic private investment in South Africa had fallen and at a lower rate in the 1980s till the 2000s, as compared to other emerging countries such as China, India, Russia, and other countries. This decline in domestic investment can be a result of there not being an attractive investment environment to the country, or there being low rates of returns to investments made in South Africa (World Bank, 2011:21-22). Domestic private investment has remained in a vulnerable position since the 2007-2009 world financial meltdown, as the South African domestic private sector is still trying to wangle itself out of the devastation that came after the meltdown.

The domestic private sector in South Africa has also been plagued with competition from the developed nations, making it more difficult to make favourable profits (SARB, 2015:12). This has led to a decline in investment, which has subsequently led to an increase in the downsizing of the labour market, and thus a fall in productivity, which has been felt heavily in the mining and automobile sectors of the country (SARB, 2015:12). This decline remained relatively the same throughout the 2007-2009 world financial crisis, but began to show an uphill trend from the last quarter of 2010 until the present day (SARB, 2015).

However, the trend of credit extended to the domestic private sector had been on the increase between 1976 – 1996, which was attributed to the increase in the demand for working capital, the lower cost of obtaining credit and also by the perceptions of anticipated higher sales coverage by the private sector (Van der Walt, 1997). This trend continues to increase into the

2000s, as the domestic private sector began to increase, with a recorded increase of 66.9% from January 2004 to September 2006 (National Credit Regulator, 2006:6). The credit extended to the domestic private sector has continued to increase over the last five years, with an increase of 8.38 % between 2010 – 2015 (SARB, 2015).

### **3.4.2 Trend of foreign investment in South Africa**

During a fixed exchange rate regime which was between the 1940s-1970s, there was unstable political conflict within the country, and also the intensification of sanctions from the international community as a method of adding pressure for the abolishment of the Apartheid regime, which led to a decline in investments as a result of huge amounts of capital outflow moving out of the country, from non-residents (Mtonga, 2011:4). This led to slow growth which the government tried to rectify by making decisions on macroeconomic policy. These decisions only made way for higher inflation rates which resulted in growing uncertainty amongst investors, thus leading to a decline in investment (Faulkner & Loewald, 2008:4). A decline in foreign investment inflows into South Africa has an unfavourabl impact on the economy because South Africa still relies heavily on foreign investment due to the low levels of domestic savings and investment by local residents (National Treasury, 1998:20).

However, foreign direct investment in South Africa during the 1970-early 1980s period was at its peak point, with the contribution of investment to Gross Domestic Product (GDP) being recorded at a rate above 25% (Faulkner & Loewald, 2008:7). This rate began to decline during the 1980s and early 1990s because of political uncertainty, coupled with high rates of inflation. Foreign capital investment inflows into the country had risen since the abolition of the Apartheid regime, with the average percentages moving from the negative GDP ratio of -2.5% in the period 1985-1994, to a positive GDP ratio of 2.4% in the period of 1995-2004.

This improvement in foreign investment was attributed to the political transition of the South African government which led to the lifting of sanctions by the international community, allowing for South Africa to operate in the international financial, trade and investment markets (Du Plessis & Smit, 2006:22). The lifting of sanctions against the South African government was due to the optimism expressed by the international community regarding the potentially improved political environment associated with the disintegration of the Apartheid regime (Faulkner & Loewald, 2008:5).

The South African rand has been through turbulent times since its adoption of the free-floating exchange rate regime in the early 2000s. The adoption of this regime resulted in the South African economy being open and vulnerable to economic, socioeconomic, political as well as other activities around the world leading to fluctuations in the world economy, such as the 2007-2009 world financial meltdown which saw a slowdown in the key import and export markets, declining prices of key commodities and a considerable fall in capital formation inflows in the country from the private sector (Kumo *et al.*, 2014:4; Baxter, 2009:112). The private sector contributes to about two-thirds of capital formation in South Africa, but there has been slow growth, with it being at an estimated growth of less than 3% in 2011 following the financial meltdown (Kumo *et al.*, 2014:4).

During 2011, a report from the UN Conference on Trade and Development called the 2011 World Investment Report found that foreign direct investments (FDI) inflows to South Africa have seen a decline from \$5.4 billion in 2009 to just over \$1.6 billion in 2010. This was mainly attributed to the 2007-2009 world financial crisis, and because of the country's frequent labour unrests and high cost of labour, as compared to the other BRICS counterparts such as India and China (Wentworth, 2012:6).

With regards to foreign portfolio investment, South Africa received high pumps of portfolio investment from the United Kingdom during the 1960s, and large inflows of foreign direct investments from the United States of America (Marais, 2001:109). This was the period in which the South African economy had reached its economic boom, and foreign investors were investing in the country mostly based on a growing domestic market. This increase in investment declined subsequently during the 1970s due to the political instability, which resulted in the economic experiencing a downward spiral (Marais, 2001:109).

During the beginning of 1994, portfolio investment dominated the foreign investment landscape of South Africa, at a contributing rate of 2% of total GDP (Aron *et al.*, 2010:26). This rate increased by a staggering 9% in 1999, and subsequently declined to about -2.5% in the 2001 financial period. However, this rate has continued to increase, although at a slow pace throughout the following years until 2008, which saw portfolio investment inflows into the country declining to its lowest rate of -3% (Aron *et al.*, 2010:26).

The foreign portfolio and direct investment prospects of South Africa going forward are still unknown, as the country's exchange rate remains in the hands of the ever-fluctuating world

economy, thus the country has experienced so many bumps in its road to economic growth and development. But despite all this, the South African government has put programmes into place which are targeted at offering incentives to investors making investments in specific sectors or types of business areas in the country. These incentives are offered in order to drive up the country's global competitiveness position, to improve infrastructure and the quality of products and services offered across provinces in the country, and also to ensure that there is high productivity in the country to avoid the downsizing of the labour market (Wentworth, 2012:15-16).

### **3.5 Summary**

This chapter presented the different types of exchange rate regimes, with the main focus being on the fixed exchange rate regime and the free-floating exchange rate regime, with the advantages and drawbacks of both these regimes being discussed. The South African government and the monetary authorities have decided from the early 2000s to make use of the free-floating exchange rate regime in order to ensure that the country becomes more competitive in the global economy. The third subsection concentrated on the historical revolution of the South African currency, which are the exchange rate regimes that the currency has undergone dating back to 1970, up until the present day where the free-floating exchange rate is being use.

The fourth and final subsection of this chapter focussed on the trend of different types of investments in South Africa over the years. The conclusions made from this subsection is that both domestic and foreign investments have gone through periods of fluctuations, all depending on the economic activity that was happening in the country, and worldwide at that point in time.

Having presented the two main+9 types of exchange rate regimes used by the South African monetary authority over the last 70 years, and providing evidence on the volatility of investments under the fixed and floating exchange rate regimes, the next chapter provides the methodology of the study.

## **CHAPTER FOUR: METHODOLOGY**

### **4.1 Introduction**

The relationship between the exchange rate and investments was analysed making use of the multivariate model, which is a statistical model used in determining, or rather analysing the possible associated relationship or patterns between more than one variable (Jekel, 2007:175). The exchange rate is the independent variable, with the different types of investments being the dependent variables. This model aims to explore the strength of the relationship between the two studied variables. A multivariate analysis was conducted by taking each dependent variable, the different types of investments, and testing it against the independent variable, being the exchange rate.

The chapter begins with the sample period and data sources, and then proceeds on to the definitions of variables used. The variables that were used include the real weighted exchange rate, domestic investment and foreign investment. The model specifications of the study follow thereafter, with the summary concluding the chapter.

This chapter aims to provide the analytical framework used in the study to examine the possible relationship between exchange rates and different types of investments in South Africa. This chapter includes the model specifications, definitions of the variables employed and the sources of the data used, which form a part of the methodology of the study. Therefore, this chapter provides the methodology that was chosen for determining the interaction between the exchange rate and different types of investments in South Africa from 1970 to 2014.

### **4.2 Sample period and data sources**

This study followed a quantitative approach using monthly and yearly observations, covering the period 1970 – 2014, which is exactly 44 years in total. This period was chosen because of the availability of data, and also because this period represents the period before and after the democratic era of the country, which provides a good pattern of behaviour of the exchange rate and investments pre and post democracy. The variables used are the real effective exchange rate and different types of investments investment, namely domestic and foreign investments, with the source of data of all of these variables being the South African Reserve Bank (SARB).

### **4.3 Definitions of variables used**

This study makes use of the real effective South African exchange rate and different types of investments. These variables will be outlined and discussed briefly below.

#### **4.3.1 The real effective exchange rate**

The real effective exchange rate can be described as the nominal exchange rate that takes the inflation differentials among the countries into consideration (The World Bank, 2015). The real effective exchange rate is used because it considers more than one currency, meaning that it weighs the South Africa rand against several foreign currencies (SARB, 2008:61). Real exchange rates are important because they are used as an indicator of competitiveness in the international trade of a country (Central Bank of the Republic of Turkey, 1997:1). It is expected that fluctuations in the effective exchange rate will have a negative relationship with different types of investment in the long-run.

#### **4.3.2 Domestic investment**

Domestic investment can be defined as the investment that is being pumped into the economy by the residents and/or by local organisations in the country (Cambridge University Press, 2015). This investment can be in the form of the purchase of fixed property and inventory, all for the purpose of increasing domestic production (Business Dictionary, 2015). The domestic investment in this study is divided into two components, namely all monetary institutions: domestic credit extension to the private sector and private domestic investment. These two components are defined below.

All monetary institutions: Domestic credit extension to the private sector can be defined as the domestic credit extensions made to all the monetary institutions in the private sector. These credit extensions include the Land Bank to both the government and the private sector (SARB, 2015). It is the broad monetary credit that is extended to the domestic private sector for investment purposes. It is expected that a long-run, negative relationship will suffice between the effective exchange rate and domestic credit extension to the private sector.

Private domestic investment is broadly defined as the amount of gross domestic product that is consumed by the private sector which forms part of their acquisition of capital goods and their investment in the domestic economy (AmosWeb, 2015). Private domestic investment is

classified in terms of two categories, namely fixed investment and changes in private inventories (Business Dictionary, 2015). It is expected that the findings from the analysis between the effective exchange rate and private domestic investment will yield a negative, long-run relationship.

### **4.3.3 Foreign investment**

Foreign investment can be defined as the investment that is made into a country by stakeholders in another. This is all done for the main purpose of foreign investors having ownership in the invested domestic country, which also involves the transfer of technology, skills and capital from one country to another (FT.com, 2014). Having ownership in assets in other countries means that foreign investors have a significant amount of management and/or control over the assets or companies that they have invested in (Investopedia, 2015). Foreign investment is divided in foreign direct investment and foreign portfolio investment in this study. The growth in the total inflow of foreign direct investment and foreign portfolio investment was used in the analysis of foreign investment. Foreign investment in this study is divided into two components, namely total portfolio investment and total direct investment, which are defined below.

Total portfolio investment can be defined as the total investment that is made by an investor, however this investment does not entail that the investor has direct management power/control in the corporation or country invested in (Gooptu, 1993:40). It is expected that the interaction between the effective exchange rate and foreign portfolio will not be significant in the short-run, but negative in the long-run.

Total direct investment can be defined as the total investment made by an investor and this enables the investor to have a certain level of managerial control over the corporation invested in (Organisation for Economic Co-Operation and Development, 1999:204). It is expected that foreign direct investment will be negatively associated with the effective exchange rate in the long-run.

#### 4.4 Model specifications

In examining the possible relationship between exchange rates and different types of investments in South Africa, a multivariate approach was used. The appropriate 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. According to Brooks (2002), 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 Vector Autoregressive Model (VAR)

The vector autoregressive model is a model which treats a set of variables equal simultaneously (Sims, 1980). The VAR model has been used and found to be useful especially for describing the dynamic behaviour of economic and financial time series, as well as for forecasting. It is useful in providing forecasts for multivariate time series models and for theory-focussed equation models (Brooks, 2014). If the time series is not stationary, then the VAR model needs to be modified in order to allow for consistency amongst the estimation of the relationships that are being tested for among the series (Dolado *et al.*, 1999).

Thus, the VAR used in this study is as follows:

$$LRER_t = \sum_{i=1}^n \beta_{1i} LRER_{t-i} + \sum_{i=1}^n \gamma_{1i} LINVEST_{t-i} + e_{1t} \quad (4.1)$$

$$LINVEST_t = \sum_{i=1}^n \beta_{2i} LRER_{t-i} + \sum_{i=1}^n \gamma_{2i} LINVEST_{t-i} + e_{2t} \quad (4.2)$$

Where:

$LRER_t$  is the log of the real exchange rate at period  $t$   $LINVEST_t$  is the log of the real private domestic investment at period  $t$ .  $\beta_{1i}$ ,  $\beta_{2i}$ ,  $\gamma_{1i}$  and  $\gamma_{2i}$  are the coefficients to be estimated;  $e_{1t}$  and  $e_{2t}$  are the error terms known as shocks in a VAR model; and  $n$  is the number of lags in the VAR model. Four different models were estimated for this study as the effective exchange rate was tested against four different types of investments. Logs were used in the estimation of the four models, so as capture the appropriate growth in the variables.

#### 4.4.2 Unit root test

According to Gujarati and Porter (2010) when dealing with time series analysis, one needs to test and check for whether an individual time series has stationarity. If there is no 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 incorrectly inferred that they do, which may be due to pure coincidence, or perhaps due to the presence of a third and unforeseen factor (Bethea & Rhinehart, 1991). Before estimating the VAR model, it is imperative to determine whether a time series is stationary or non-stationary. There are two general approaches to testing for stationarity, parametric and nonparametric. Reviews of the literature seem to indicate that parametric approaches are those usually used by researchers working in the time domain, such as economists, who are making certain assumptions about the nature of their data. Non-parametric approaches are more commonly seen by researchers working in the frequency domain, such as electrical engineers, who often treat the system as a "black box" and cannot make any basic assumptions about the nature of the system. Non-parametric tests are not based on the knowledge or assumption that the population is normally distributed (Bethea & Rhinehart, 1991).

By making no assumptions about the nature of the data, non-parametric tests are more widely applicable than parametric tests which often require normality in the data. While more widely applicable, the trade-off is that nonparametric tests are also less powerful than parametric tests. To arrive at the same statistical conclusion with the same confidence level, non-parametric tests require anywhere from 5% to 35% more data than parametric tests (Bethea & Rhinehart, 1991). For the purpose of this study, the Augmented Dickey-Fuller (ADF) unit root tests, at level and 1<sup>st</sup> difference, were conducted to check whether the variables were stationary or not. If both the observed variables were found to be stationary, then VAR equations 1 and 2 were estimated. However, if the two observed variables were found not to be stationary, then they were differenced until they became stationary. If the variable become stationary after the first difference, I(1), then a co-integration test was estimated to determine whether a linear combination of the variables was stationary. This is, thus, regarded as a long-run relationship (Brooks, 2002:388).

### 4.4.3 Co-integration

In the event that two series move together simultaneously then it can be assumed that an equilibrium relationship exists between the two series. This, thus, suggests that the variables are co-integrated but are not stationary in the short-term, however, they will move together over time, thus their differences will eventually be stationary (Sibanda, 2012:54). This study used the Johansen's multivariate co-integrating VAR approach to identify whether there was a long run relationship between the variables. The Johansen's (1988 and 1991) multivariate co-integrating is derived from a VAR model as follows:

Considering unrestricted VAR model:

$$Z_t = \sum_{i=1}^k A_i Z_{t-i} + e_t \quad (4.3)$$

Where:

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

$e_t$  = a column vector of random errors which are usually assumed to be contemporaneously correlated but not auto-correlated. Assuming that all variables are co-integrated in the same order, the VAR model in Equation 3 can be presented as follows:

$$\Delta Z_t = \Pi Z_{t-k} + \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + e_t, \quad \text{for } k \geq 2 \quad (4.4)$$

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

According to Johansen & Juselius (1990), the matrix  $\Pi$  can be expressed as a product of two matrices:

$$\Pi = \alpha\beta' \quad (4.4)$$

Where:

$\alpha$  and  $\beta'$  are both the same since  $\Pi$  is a square matrix.

The matrix  $\beta'$  gives the co-integrating vectors (a matrix of long run coefficients), while  $\alpha$  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 the examination of the  $\Pi$  matrix. The test for co-integration is conducted by looking at the rank ( $r$ ) of the  $\Pi$  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:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad (4.5)$$

$\lambda_{trace}$  is a joint test where:

$H_0$ : the number of co-integrating vectors  $\leq r$  and

$H_a$ : the number of co-integrating vectors  $> r$ .

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

$$\lambda_{max}(r, r + 1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (4.6)$$

Where:

$r$  is the number of co-integrating vectors under the null hypothesis,  $\hat{\lambda}_i$  is the estimated value for  $i^{\text{th}}$  ordered eigenvalue from the  $\Pi$  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  $H_1: 2 < r \leq n$

$$\dots \quad \dots \quad \dots$$

$$H_0: r = n-1 \text{ versus } H_1: r = n$$

The first test involves a  $H_0$  of non-co-integrating vectors (corresponding to  $\Pi$  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. If the co-integration is not present then the first difference of the VAR model in Equation 4.1 and 4.2 is used (Abdalla & Murinde, 1997). However, if variables are found to be co-integrated then the following vector error correction model (VECM) is used to capture the error correction.

#### 4.4.4 Vector Error Correction Model (VECM)

The Vector Error Correction Model (VECM) is a statistical model used with the sole intend of being used with time series that is non-stationary, but are recognised to be co-integrated. The vector error correction model (VECM) is interrelated with co-integration because it provides a restriction for the long-run behaviour and trends of the endogenous variables to converge to their co-integrating relationships, whilst making room and availing itself for short-run adjustment dynamics (Brooks, 2002). Co-integration is also known and phrased as the correction error since the long-run equilibrium is corrected gradually through a series of short-run adjustments over time; this, thus, forms the foundation and the basis for the presence of the vector error correction model. The VECM model shows which of the variables that are being used in the study responds more to any shocks that may be in the system (Brooks, 2008). If it is found that the variables are co-integrated, then the Vector error correction model (VECM) will be estimated. If the variables are found to not be co-integrated then the VAR model needs to be estimated at the 1<sup>st</sup> difference (Abdalla & Murinde, 1997). The VECM model for this study is as follows:

$$\Delta LRER_t = \sum_{i=1}^n \beta_{1i} \Delta LRER_{t-i} + \sum_{i=1}^n \gamma_{1i} \Delta LINVEST_{t-i} + \alpha_1 u_{1t-1} + e_{1t} \quad (4.7)$$

$$\Delta LINVEST_t = \sum_{i=1}^n \beta_{2i} \Delta LRER_{t-i} + \sum_{i=1}^n \gamma_{2i} \Delta LINVEST_{t-i} + \alpha_2 u_{2t-1} + e_{2t} \quad (4.8)$$

Where:

$LNER_t$  is the log of the real exchange rate at period  $t$ .  $LINVEST_t$  is the log of the real private domestic investment at period  $t$ .

$u_{1t-1}$  And  $u_{2t-1}$  are the error correction terms; and  $\alpha_1$  and  $\alpha_2$  are error correction coefficients which are anticipated to capture the adjustments, or shocks, of change in the real effective exchange rate ( $\Delta LNER_t$ ) and change in the real gross private domestic investment ( $\Delta LINVEST_t$ ) towards long-run equilibrium, while the coefficients on  $\Delta LNER_{t-i}$  and  $\Delta LINVEST_{t-i}$  are expected to capture the short-run dynamics of the Vector Error Correction Model (VECM) model (Abdalla & Murinde, 1997).

The choice of lags in the VAR Model is of crucial importance (Li & Liu, 2012). Thus, the optimum numbers of lags were selected, based on the criterion of the Schwartz Information Criterion and the Aikaike Information Criterion (AIC) (Ivanov & Kilian, 2005). Other diagnostic tests were conducted include autocorrelation and heteroscedasticity. The Granger causality model was also conducted. The Granger causality model is defined and described extensively and in more detail in Section 4.4.8 of this chapter.

#### **4.4.5 Impulse response analysis**

According to Brooks (2014) the impulse response analysis refers to an analysis that traces of the responsiveness of the dependent variable to shocks in each of the other variables included in a study or research paper. Since shocks may occur and affect a singular variable in the model, it can also capture and generate different variations and reactions not only in itself but also in the other variables in the model, the impulse response analysis is conducted (Gunes, 2007). 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. This study made use of the impulse response analysis because it makes use of historical patterns of correlations that exists amongst the different shocks that may affect the impulse response analysis.

#### **4.4.6 Variance decomposition of forecast errors**

The variance decomposition of forecast errors is defined as an econometric time-series analysis method that is used in the estimation of the vector autoregressive model (VAR), and

this tool is used as a measure of the contribution that each shock contributes to the forecast error variance (Seymen, 2008:1). Each shock that the variance decomposition of forecast errors measures is associated with all the concerned variables that are being made use of in the econometric analysis.

#### **4.4.7 Diagnostic tests**

Diagnostic tests are an imperative part of econometrics as they validate the parameter estimation outcomes that are accomplished by the estimated model that is being made use of in the study (Sibanda, 2012:57). A variety of diagnostic tests have been established in the study of econometrics for the main possible occurrence of pitfalls that may have an effect on the quality of conclusions drawn from models, such diagnostic tests includes testing for autocorrelation, heteroscedasticity, normality and a variety of others (Zeileis & Hothorn, 2002:1). These tests are useful in the assessing the goodness-of-fit of data models, particularly because they do not only make use of omnibus tests but also tests that are designed for a certain direction of the alternative (Breiman, 2001). For the purpose of this study only autocorrelation and heteroscedasticity tests will be conducted with regards to the diagnostic tests.

Autocorrelation occurs when the error terms that have been accumulated are perfectly correlated over different periods of time. This happens when the error terms related to the observations in a given period of time, in time series data, carry over into periods that are yet to be experienced (Sibanda, 2012:58-59).

Heteroscedascity refers to 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 heteroscedastic (Sibanda, 2012:58).

#### **4.4.8 Granger causality model**

The Granger causality model is a model that is based on 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 (Weiner, 1956). Essentially the Granger causality model is a model that is used to determine whether one time series can be used successful in predicting another time series,

meaning that the model was formed and is based fundamentally on predictions (Seth, 2007). 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 (Granger, 1969).

According to Seth (2007) the application and implementation of the Granger causality model is the model completely depends on the relevant selection of variables, thus causal factors that are excluded in the regression model cannot be represented by the output generated by the regression model.

Although the Granger causality model is a good technique for forecasting, it also not without its limitations. Firstly, when testing a two variable Granger causality without taking into account the effects of other relevant and possibly influential variables can possibly lead to specification bias (Gujarati, 1995). A causality test is said to be fragile to model specification and the amount of lags that are included in the model. This will most likely lead to different results being revealed if it was not included in the model (Gujarati, 1995). Secondly, most time series data are non-stationary in nature, which leads to the problem of spurious regression, meaning that the regression is not what it was intended to be, or rather the regression becomes false or fake (Huang *et al.*, 2004:34).

#### **4.5 Summary**

This chapter specified the chosen model, which was the Vector Autoregressive Model (VAR), which was used in the analysis of the interaction between the exchange rate and different types of investments in South Africa from 1970 to 2014. The multivariate model was used to determine relationship between the variables, with the exchange rate being the independent variable and the four different investments being the dependent variables. Thus, four models were estimated and logs were used in order to capture any growth associated with the variables.

The second sub-section of the study provided the sample period and the sources of the data that was used in the study, with the third sub-section focused on the definitions of the variables that the study made use of. It is expected that the analysis of the exchange rate and different types of investments in South Africa will yield a negative, long-run relationship.

The fourth sub-section of the chapter provided an explanation of the appropriate approach which was selected for the analysis of the exchange rate and different types of investments. 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 sub-section also included the definitions of the unit root test, co-integration test, the Vector Error Correction Model (VECM), impulse response analysis, variance decomposition of forecast errors, diagnostic tests and the Granger causality tests that were employed in the analysis between the exchange rate and different types of investments in South Africa from 1970 to 2014.

Having outlined the methodology and the model to be used, the results and research findings of the study are provided in the next chapter.

## CHAPTER FIVE: RESULTS AND DISCUSSIONS

### 5.1 Introduction

The relationship between exchange rates and investments has been a topic of discussion over the years, and differing views have been put forward in this regard. Considering that there are different types of investments (Enever *et al.*, 2014:1), the debate is mostly based on which type of investments that affect the exchange rate the most. The issue of relevant model used to analyse the relationship between investment and exchange rate also contribute to the debate, as the model can affect the results. This chapter of the study aims to provide the results of the tests conducted to analyse the interaction between the real effective exchange rate and different types of investments in South Africa.

This chapter is divided into four major sections. The first section is the introduction, and then followed by the presentation of the results of the tests conducted. The graphical analysis is presented first, followed by the descriptive analysis between the variables. The correlation analysis follows thereafter, followed by the stationarity tests for the variables. The long-run relationship of the studied variables follows, which includes the lag selection and co-integration tests. The 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 LM tests and the white heteroscedasticity test, the impulse response analysis, the variance decomposition of the variables and the Granger causality test follows thereafter.

The third section of this chapter provides the discussion of the results obtained. This section will also provide the implications that these results may have on the South African economy, and how these implications may affect policymakers and investors alike. The last section of this chapter is the summary, which provides the closing remarks and a brief overview of the chapter as a whole.

### 5.2 Presentation of results

The presentation of the results begins with the results of the relationship between the real effective exchange rate and domestic credit extension to the private sector, and then continues on with the results of the link between the real effective exchange rate and private domestic investment. The third presentation of results represents the relationship between the effective

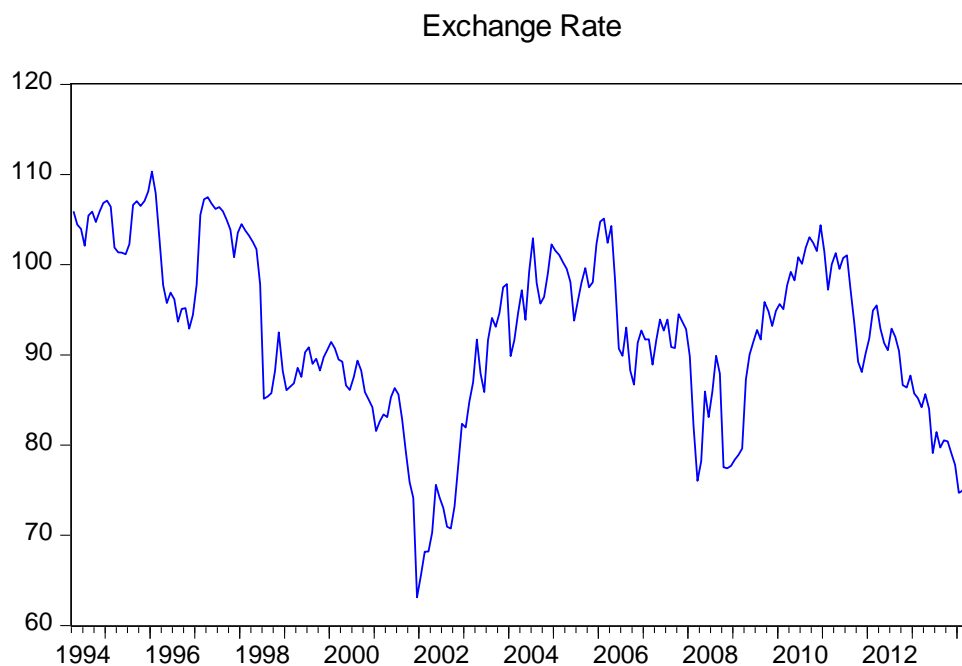
exchange rate and foreign direct investment, and then ending off with the results of the link between the real effective exchange rate and foreign portfolio investment.

### 5.2.1 Analysis of the link between exchange rate and domestic credit extension

The exchange rate is expected to be linked to the domestic credit extension to the private sector because the credit that is extended out to the domestic private sector, as a form of investment, is dependent on the behaviour of the domestic exchange rate. This sub-section analyses this relationship in the South African context.

The sub-section starts with the graphical analysis of the behaviour of the two variables, and then followed by the descriptive analysis. The results then continue on with the presentation of the results obtained from the correlation analysis of the exchange rate and the domestic credit extension to the private sector. Stationarity test results are presented, then followed by the results obtained from the long-run relationship tests conducted for the two variables. . The results of the VECM are then presented, and then followed by the results of the diagnostic tests, as the diagnostic tests are conducted on the results of the VECM. The impulse response analysis results will follow thereafter, followed by the variance decomposition results, and finally the Granger causality results.

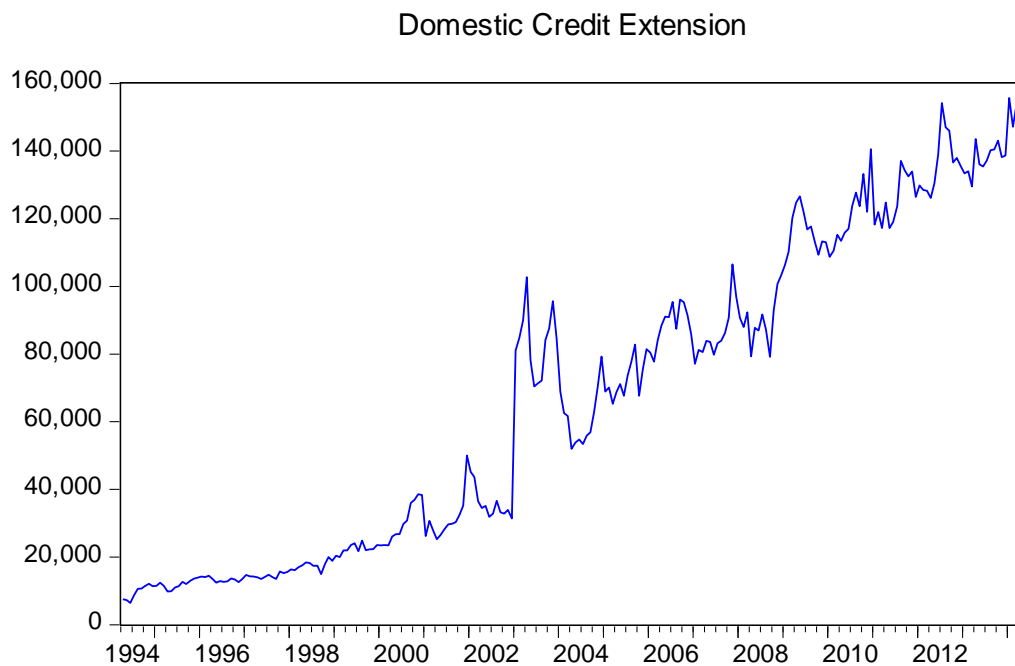
#### 5.2.1.1 Graphical analysis of real effective exchange rate and domestic credit extension



**Figure 5.1: Exchange rate**

Source: Own estimates based on data from SARB

Figure 5.1 represents the graphical presentation of the monthly exchange rate from 1994 to 2014. The figure shows that real effective exchange rate has had a fluctuating but positive trend throughout the period that the study has been conducted. The figure illustrates that the lowest point experienced by the South Africa exchange rate was during the late 2001 until the beginning of 2002, but the rand has maintained a fluctuating pattern throughout. This fluctuating trend is attributed to the fact that South Africa has been making use of the free-floating exchange rate regime.



**Figure 5.2: Domestic credit extension**

Source: Own estimates based on data from SARB

Figure 5.2 illustrates the graphical representation of the monthly domestic credit extension to the private sector from 1994 to 2014. This figure shows that domestic credit extension has been on the rise in South Africa since 1994. This upward trend means that investment made in terms of extending credit to domestic entities has been growing throughout the democratic and free-floating exchange rate era of South Africa.

Figure 5.1 and 5.2 show the trend of performance of the real effective exchange rate and domestic credit extension to the private sector in South Africa since 1994 to 2014. Figure 5.1 shows that during the late 2001 until the beginning of 2002 the exchange rate experienced the

worst depreciation, however, domestic credit extension to the private sector increased during that period, as illustrated in Figure 5.2. This implies that investment was stimulated when the exchange rate experienced a downfall. However, the exchange rate has been fluctuating and the domestic credit extension to the private sector has maintained an upward trend, which also implies that the two variables have no significant effect on each other in the short-run.

### 5.2.1.2 Descriptive analysis of real effective exchange rate and domestic credit extension

**Table 5.1: Descriptive statistics of real effective exchange rate and domestic credit extension**

	<b>EXCHANGE_RATE</b>	<b>CREDIT_EXTENSION</b>
<b>Mean</b>	92.19415	67374.01
<b>Median</b>	92.69	70070
<b>Maximum</b>	110.31	155678
<b>Minimum</b>	63.11	6392
<b>Std. Dev.</b>	9.657941	46173.13
<b>Skewness</b>	-0.425646	0.236154
<b>Kurtosis</b>	2.723815	1.626524
<b>Jarque-Bera</b>	8.043134	21.18299
<b>Probability</b>	0.017925	0.000025
<b>Observations</b>	241	241

Source: Own estimates based on data from SARB

Table 5.1 represents the results of the descriptive analysis conducted for the real effective exchange rate and domestic credit extension to the private sector. The results show that the average value of all exchange rate observations is 92.19, and the average value of all domestic credit extension to the private sector values is 67374.01, which is presented in millions. The standard deviation yielded by the exchange rate is 9.65, which means that 9.65

is the average distance between the observations and mean of the observations, and for the domestic credit extension to the private sector, the value of the standard deviation is 46173.13 million. The skewness for the exchange rate shows that the distribution is skewed to the left, which is also referred to as being negatively skewed. The skewness of the domestic credit extension to the private sector shows that the distribution is skewed to the right, or positively skewed. This also means that there were large data values associated with the domestic credit extension to the private sector variable. The kurtosis and Jacque-Bera tests check for normality in the distribution. With regards to the exchange rate and domestic credit extension, the kurtosis and Jacque-Bera tests show that the variables are not normally distributed. This is also confirmed by the small value of the probabilities of both the variables.

### 5.2.1.3 Correlation analysis of real effective exchange rate and domestic credit extension

**Table 5.2: Cross correlation test of real effective exchange rate and domestic credit extension**

Period	Lag	Lead
0	-0.2196	-0.2196
1	-0.2063	-0.2176
2	-0.1982	-0.2131
3	-0.1879	-0.2073
4	-0.1773	-0.202
5	-0.1626	-0.2009
6	-0.1482	-0.1992
7	-0.1363	-0.1989
8	-0.1267	-0.1982
9	-0.1208	-0.1989
10	-0.1154	-0.2003

Source: Own estimates based on data from SARB

Table 5.2 illustrates the results obtained from the cross correlation test for the real effective exchange rate and domestic credit extension to the private sector for the period of the study. The cross correlation test is an econometric test which is used for determining whether a positive or negative relationship exists between variables (Taylor, 2006:239-240). In table 5.2 above, there exists a weak, negative correlation between the real effective exchange rate and domestic credit extension to the private sector in South Africa. The weakness of the relationship is show by the low values of the lag and lead columns, which also implies that the presence of the relationship between the two variables is small. Thus, this indicates that there is a negative but not significant relationship between the real effective exchange rate and domestic credit extension to the private sector in the short-run. In the long-run, however, this negative relationship implies that when one of the variables increases, then the other variable will decrease.

#### 5.2.1.4 Stationarity tests of real effective exchange rate and domestic credit extension

**Table 5.3: Unit root test results: real effective exchange rate and domestic credit extension**

		Level		1st difference	
		RER	Credit Extension	RER	Credit Extension
<b>ADF</b>	<b>t-statistic</b>	-2.367	-0.665	-11.807	-17.739
	<b>p-value</b>	0.152	0.851	0.000	0.000

Source: Own estimates based on data from SARB

Table 5.3 illustrates the results of the Augmented Dickey Fuller unit root tests conducted for the real effective exchange rate and domestic credit extension to the private sector. At level, the p-values of the real effective exchange rate (RER) is 0.152, which greater than the 0.05; meaning that the null hypothesis that RER has a unit root is accepted at the 5 percent level of significance. This means that RER is not stationarity at level. However, at 1<sup>st</sup> difference, the p-value of the real effective exchange rate is 0 (< 0.05); meaning that the null hypothesis for unit in RER is rejected at the 5 percent level of significance. Therefore the real effective exchange rate is stationarity at 1<sup>st</sup> difference, implying that it is I(1).

The results of the unit root test for the domestic credit extension to the private sector variable show that at level the p-value is greater than 0.05, meaning that, at the 5 percent level of significance, the null hypothesis that domestic credit extension to the private sector has a unit root is accepted. At 1<sup>st</sup> difference, however, the domestic credit extension to the private sector becomes stationary as the null hypothesis is rejected at the 5 percent level of significance (p-value < 0.05). This means that the domestic credit Extension to the private sector is stationarity at 1<sup>st</sup> difference, implying that it also is I(1). These results show that both the two variables have a unit root at level but become stationary at 1<sup>st</sup> difference. Thus both variables are I(1). This means that there is a possibility that the two variables may be integrated; thus, the co-integration test should be conducted next.

#### **5.2.1.5 Long-run relationship between real effective exchange rate and domestic credit extension**

Since the variables have proven to be I(1), the multivariate Johansen co-integration test can be used to test for the long-run relationship between the variables. Before conducting the co-integration test the number of lags in the model should be identified first, the information criteria were used to select the optimal number of lags to be used.

**Table 5.4: Lag selection for real effective exchange rate and domestic credit extension**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3615.92	NA	1.81E+11	31.59754	31.62753	31.60964
1	-2904.67	1403.865	3.76E+08	25.42069	25.51065*	25.45698
2	-2895.84	17.28068	3.60E+08	25.37847	25.52842	25.43897*
3	-2891.32	8.753722	3.59e+08*	25.37398*	25.5839	25.45867
4	-2889.86	2.805258	3.67E+08	25.39616	25.66606	25.50505
5	-2884.82	9.592342*	3.64E+08	25.38709	25.71697	25.52017
6	-2881.94	5.434881	3.67E+08	25.39687	25.78672	25.55414
7	-2879.36	4.81738	3.72E+08	25.40929	25.85912	25.59076
8	-2877.15	4.097271	3.78E+08	25.4249	25.93471	25.63057

Source: Own estimates based on data from SARB

Table 5.4 shows the results of the Lag selection criterion conducted for the exchange rate and domestic credit extension to the private sector. From the table, the Schwartz Information Criterion (SC) selected a lag selection of 1 optimal lags, while the Hannan-Quinn Information Criterion (HQ) selected a lag selection of 2 optimal lags. The Akaike Information Criterion (AIC) and the Final Prediction Error (FPE) selected a lag of 3 optimal lags. 1 optimal lag was selected for the analysis of the exchange rate and domestic credit extension as it produced better results than 2 and 3 lags.

**Table 5.5: Johansen co-integration test results: real effective exchange rate and domestic credit extension**

Hypothesized No. of CE(s)	Trace statistic		Maximum Eigen Value	
	Trace statistic	p-value	Trace statistic	p-value
None	34.537	0.003	27.750	0.002
At most 1	6.786	0.367	6.786	0.367

Source: Own estimates based on data from SARB

Table 5.5 illustrates the results of the Johansen co-integration test for the real effective exchange rate and domestic credit extension to the private sector. The p-values of the Trace statistic and the Maximum Eigen Value of no co-integrating equation are less than 0.05; meaning that at the 5 percent level of significance the null hypothesis for no co-integrating equation is rejected. However, the p-values of the Trace statistic and the Maximum Eigen Value of at most 1 co-integrating equation are more than 0.05; meaning that at the 5 percent level of significance, the null hypothesis for of at most 1 co-integrating equation is accepted. This means that there exists 1 co-integrating equation between the two variables; implying that there is a long-run relationship between the real effective exchange rate and the domestic credit extension to the private sector. The equation that describes this long-run relationship is shown by equation 5.1.

$$\text{Exchange\_Rate} = 95.9700 - 0.0000568 \text{ Credit\_Extension} \quad (5.1)$$

Equation 5.1 above shows the co-integrating equation, shows that the domestic credit extension to the private sector has a long-run negative effect on the real effective exchange rate. This means when the domestic credit extension to the private sector falls by 1% then the real effective exchange rate increases by 0.00568%. The existence of the 1 co-integrating equation means that the Vector Error Correction (VECM) can be estimated to capture the speed of adjustment to long-run equilibrium. Thus, VECM is estimated next.

### **5.2.1.6 Short-run relationships between real effective exchange rate and domestic credit extension**

**Table 5.6: Short-run VECM results: real effective exchange rate and domestic credit extension**

<b>Error Correction:</b>	<b>D(EXCHANGE_RATE)</b>	<b>D(CREDIT_EXTENSION)</b>
ECT	-0.04705	-56.01001
	-0.01974	-45.7862
	[-2.38346]	[-1.22330]
D(EXCHANGE_RATE(-1))	0.235713	-9.282952
	-0.06442	-149.412
	[ 3.65919]	[-0.06213]
D(EXCHANGE_RATE(-2))	-0.150097	72.50769
	-0.06472	-150.105
	[-2.31933]	[ 0.48305]
D(CREDIT_EXTENSION(-1))	3.49E-05	-0.131394
	-2.80E-05	-0.06552
	[ 1.23652]	[-2.00544]
D(CREDIT_EXTENSION(-2))	-3.41E-05	0.071858
	-2.80E-05	-0.0659
	[-1.20014]	[ 1.09036]
C	-0.097012	664.8784
	-0.18222	-422.646
	[-0.53239]	[ 1.57313]

T-values in []

Source: Own estimates based on data from SARB

Table 5.6 above represents the results of the Vector Error Correction Model (VECM) for the study. The VECM is used as a mode of determining the short-run properties of the variables that have been co-integrated, being the exchange rate and the domestic credit extension to the private sector. The results show that when exchange rate is the dependent variable, the error correction term has a significant (t-value > 1.96) negative coefficient. This means that there exists a long-run relationship between the two variables emerging from the exchange rate equation or when exchange is set as dependant variable. The value of the error correction coefficient of -0.04705 means that approximately 4.71% of deviation from equilibrium is eliminated in every month of the year. Thus, the model takes about 21.23 months to adjust to the full equilibrium, suggesting the slow adjustment to the equilibrium.

The exchange rate lags are significant meaning that past changes in the exchange rate have effect on the current changes in the exchange rate. The lags of domestic credit extension to the private sector are not significant (t-values < 1.96) meaning that the previous changes in the domestic credit extension to the private sector have no effect on current changes in the real exchange rate. Thus, short-term changes in the domestic credit extension to the private sector have not effect on the real exchange rate.

In the domestic credit extension to the private sector equation (second equation), the two lags of the exchange rate are not significant (the t-values < 1.96), meaning that previous changes in the real exchange rate have no effect on current change in domestic credit extension to the private sector. Thus, the short-run changes in the real exchange rate have not effect on domestic credit extension to private investors in the country.

The variance decomposition and the impulse response analysis should be conducted to supplement the short-run VECM results. But the diagnostic tests, which include the autocorrelation and heteroscedasticity tests, are conducted first to confirm if the VECM meet all econometric assumptions.

**Table 5.7: Autocorrelation LM test for real effective exchange rate and domestic credit extension**

<b>Lags</b>	<b>LM-Stat</b>	<b>Prob.</b>
1	2.911932	0.5727
2	3.022828	0.554
3	3.244508	0.5178
4	9.786232	0.0442
5	4.231286	0.3756
6	5.731468	0.2201
7	1.713129	0.7883

Source: Own estimates based on data from SARB

Table 5.7 illustrates the results of the autocorrelation LM test for the real effective exchange rate and domestic credit extension to the private sector for the study. The results from the table show that 7 lags were included in the analysis, and that the probabilities of all the LM-Stat lags, excluding the 4<sup>th</sup> lag, were greater than the 0.05 significance level. This means that the autocorrelation LM test was successful at these lags. However, the probability of the 4<sup>th</sup> LM-Stat lags was less than the 0.05 significance level; therefore the autocorrelation LM test was not successful at the 4<sup>th</sup> lags. It can be concluded from the results that the majority of the results passed the autocorrelation LM test; therefore there is no serial autocorrelation in the model.

**Table 5.8: White heteroscedasticity test for real effective exchange rate and domestic credit extension**

<b>Chi-sq</b>	<b>df</b>	<b>Prob.</b>
69.078	60	0.197

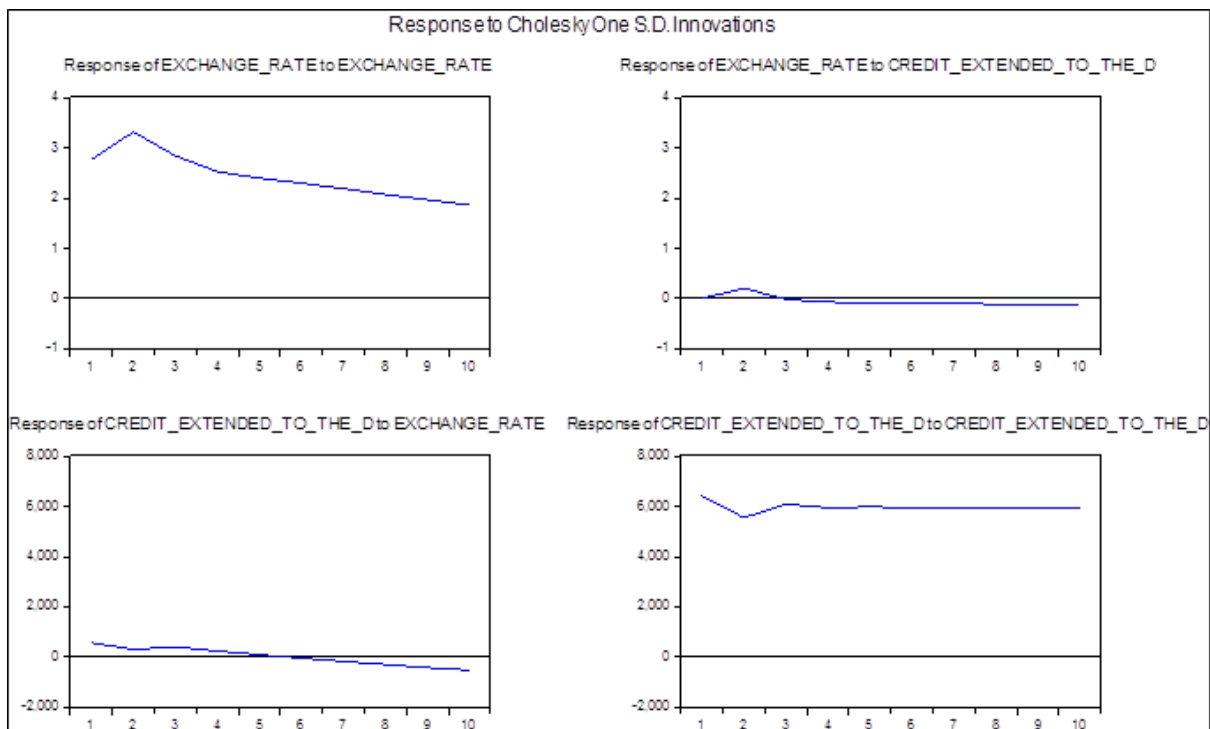
Source: Own estimates based on data from SARB

Table 5.8 illustrates the results of the white heteroscedasticity with cross terms test for the real effective exchange rate and the domestic credit extension to the private sector variables.

The table shows that the probability of Chi-square of 0.19 is greater than 0.05; meaning that, at the 5 percent level of significance, the null hypothesis that there is no heteroscedasticity is accepted. Therefore, there is no heteroscedasticity in VECM model used for analysis of the link between real effective exchange rate and domestic credit extension to the private sector. Thus, the next step is to conduct a further analysis of the short-run relationship between the variables with the variance decomposition and impulse response analysis.

### Impulse response analysis

Figure 5.3 below is the graphical representation of the impulse response analysis function for real effective exchange rate and domestic credit extension to the private sector. The figure illustrates how the two variables react to its own shocks, as well as the shocks from the other variable, over the study period.



**Figure 5.3: Impulse response analysis of real effective exchange rate and credit extension**

Source: Own estimates based on data from SARB

The first graph from Figure 5.3 shows that a shock in the real exchange rate has a positive but declining effect on the exchange rate from 1994 to 2014. This means that the real exchange rate react to its own shock, especially in the first 4 months. A change in the domestic credit

extension has an increasing, then negative and declining effect on the real effective exchange rate but it dies away after the second month. This suggests that real exchange rate do not react to shocks from the domestic credit extension. From the third graph, it can be seen that changes in the real effective exchange rate has a small decline effect on domestic credit extension to the domestic private sector, and falls to zero at the 5<sup>th</sup> period and follows into the negative values. This means that the domestic credit extension to the private sector reacts negatively to shocks in the real effective exchange rate; but the reaction seems to be very small. The last graph shows that reaction of the domestic credit extension to the private sector to its own shocks is only visible the first and the second and become stable after period 3. Thus, the domestic credit extension to the private sector is affected by its own shocks.

Overall, the impulse response analysis has shown that movements in the real effective exchange rate has a small but negative effect on the domestic credit extension to the private sector, and any changes in the domestic credit extension to the private sector has a negative and declining effect on the real effective exchange rate. However, these effects are small, suggesting that the variables may not affect each other in the short-run. These results are similar to the VECM short-run result which suggests that there is no significant short-run relationship between the two variables.

**Table 5.9: Variance decomposition of real effective exchange rate**

<b>Period</b>	<b>S.E.</b>	<b>EXCHANGE_RATE</b>	<b>CREDIT_EXTENSION</b>
1	2.775567	100	0
2	4.330309	99.77176	0.228239
3	5.180433	99.83935	0.160649
4	5.764419	99.85602	0.143984
5	6.24322	99.85958	0.140417
6	6.653858	99.85996	0.14004
7	7.005194	99.85428	0.145723
8	7.306827	99.84314	0.156855
9	7.568215	99.82752	0.172483
10	7.796613	99.80815	0.191853

Source: Own estimates based on data from SARB

Table 5.9 represents the variance decomposition analysis of the real effective exchange rate. From this table, it can be seen that, the domestic credit extension to the private sector contribute 0.22% to variance in the real exchange rate, in the 2<sup>nd</sup> period, but the contribution of the domestic credit extension to the private sector begins to fall from the 3<sup>rd</sup> period. This fall continues on until the 8<sup>th</sup> period, where the contribution of credit extended to the domestic private sector to variance in the real effective exchange rate starts to increase up 0.19% in the 10<sup>th</sup> period. This suggests that domestic credit extension to the private sector seems not to contribute to variance in the real effective exchange rate; implying that the domestic credit extension to the private sector does not contribute to short-run changes in the real effective exchange rate.

**Table 5.10: Variance decomposition of domestic credit extension**

Period	S.E.	EXCHANGE_RATE	CREDIT_EXTENSION
1	6437.809	0.764966	99.23503
2	8505.45	0.567742	99.43226
3	10470.03	0.513234	99.48677
4	12049.26	0.428343	99.57166
5	13453.85	0.348553	99.65145
6	14712.27	0.292739	99.70726
7	15868.7	0.264616	99.73538
8	16943.06	0.264	99.736
9	17951.55	0.289395	99.7106
10	18905.23	0.338859	99.66114

Source: Own estimates based on data from SARB

Table 5.10 above represents the results of the variance decomposition analysis of the domestic credit extension to the private sector. This table shows that, without the contribution of the domestic credit extension to the private sector, the contribution of the exchange rate to domestic credit extension to the private sector begins at 0.76% in the 1<sup>st</sup> period then decreases gradually to 0.56% in the 2<sup>nd</sup> period, and continues to fall to the lowest rate of 0.264% in the 7<sup>th</sup> period. This rate then begins to increase to 0.33% in the 10<sup>th</sup> period. This suggests that the real effective exchange does not seem to contribute significantly to short-run changes in the domestic credit extension to the private sector.

Overall, the results from the Tables 5.8 and 5.9 imply that both the real effective exchange rate and the domestic credit extension to the private sector contribute to each other but not to a significant point. Declining effects between these two variables confirms the negative reaction observed in the impulse response analysis. Furthermore, it also confirms a non-significant short-run relationship from the VECM results.

**Table 5.11: Granger causality test of real effective exchange rate and domestic credit extension**

<b>Null Hypothesis:</b>	<b>F-Statistic</b>	<b>Prob.</b>
$\Delta RER$ does not Granger Cause $\Delta CREDIT\_EXTENSION$	0.653	0.521
$\Delta CREDIT\_EXTENSIOND$ does not Granger Cause $\Delta RER$	1.182	0.308

Source: Own estimates based on data from SARB

Table 5.11 illustrates the results of the Granger causality test for the real effective exchange rate and the domestic credit extension to the private sector variables for the study period. The results show that the null hypothesis that real effective exchange rate does not Granger cause domestic credit extension to the private sector is accepted at the 5 percent level of significance (p-value > 0.05). Similarly, the null hypothesis that domestic credit extension to the private sector does not Granger cause real effective exchange rate is accepted at the 5 percent level of significance (p-value > 0.05). This implies that there is no causal relationship between the two variables. In other words, the real effective exchange rate does not Granger cause domestic credit extension to the private sector, and the domestic credit extension to the private sector does not Granger cause the real effective exchange rate.

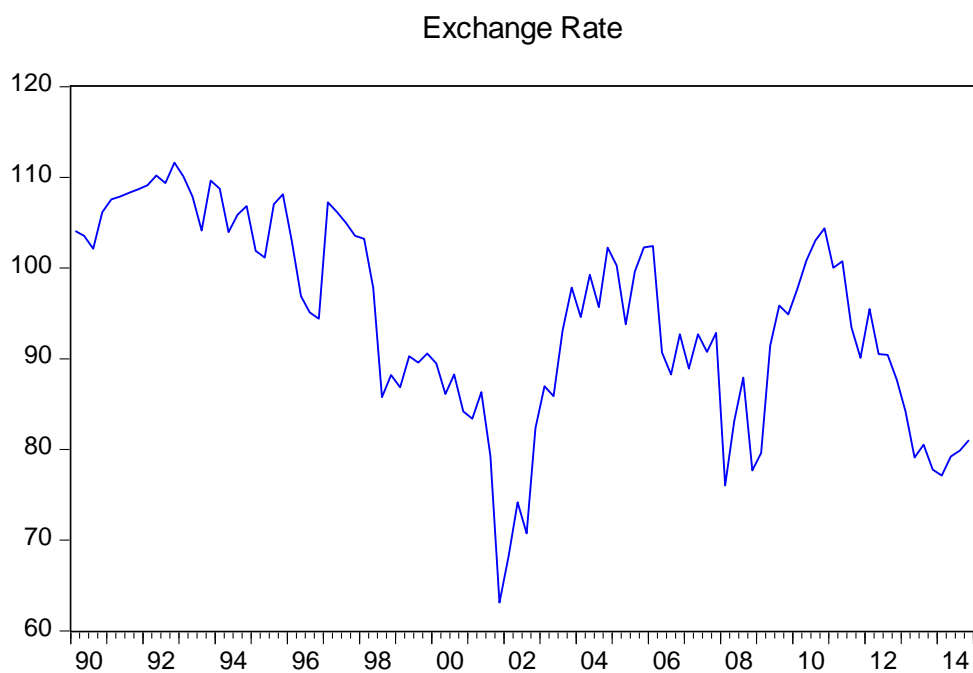
The results found from the Granger causality test are confirmed by the results found by the variance decomposition, the impulse response analysis and the VECM, which showed that the real effective exchange rate and the domestic credit extension to the private sector do not have an effect on each other in the short-run. Thus, these two variables are not interlinked together in the short-run, but there is a negative relationship between the two variables in the long-run.

### **5.2.2 Analysis of the link between exchange rate and private domestic investment**

The exchange rate is expected to be linked to private domestic investment because investment decisions made by investors are highly dependent on the performance of the exchange rate and the country's ability to attract and maintain investment from domestic and international investors. Thus, it is expected that the results from this sub-section will show that the exchange rate is interlinked with private domestic investment.

The analysis of the link between the exchange rate and private domestic investment starts with the graphical analysis and the descriptive analysis of the two variables. These results are then followed by the correlation analysis and the stationarity test results. The VECM test results are then presented, followed by the diagnostic tests of autocorrelation and heteroscedasticity. The impulse response analysis figure follows right after the diagnostic tests, followed by the variance decomposition and Granger causality test for the two variables.

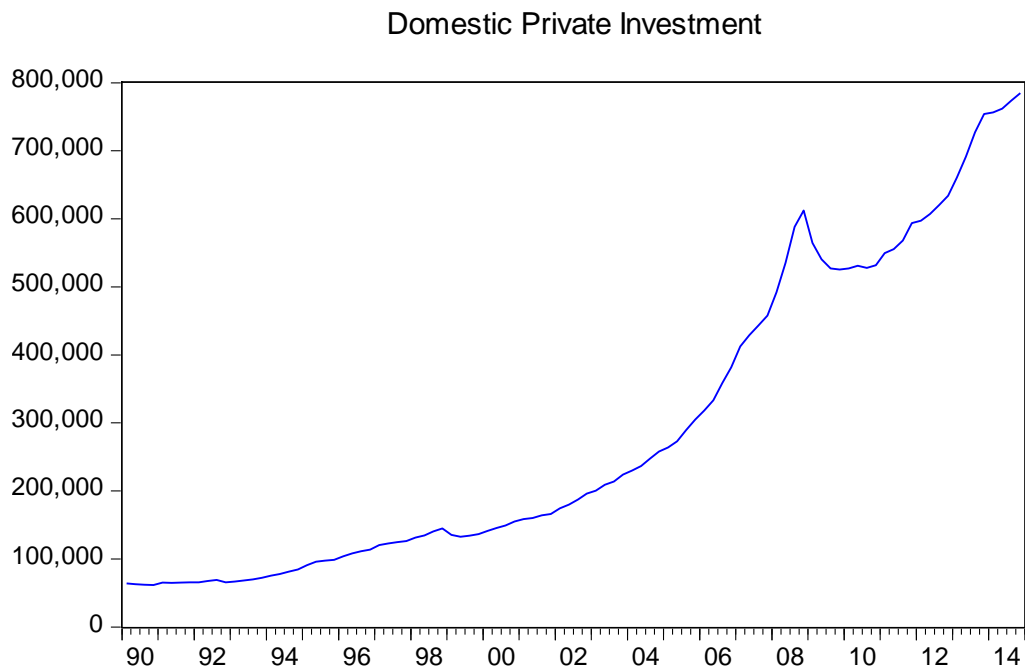
### 5.2.2.1 Graphical analysis of real effective exchange rate and private domestic investment



**Figure 5.4 Exchange rate**

Source: Own estimates based on data from SARB

Figure 5.4 illustrates the graphical presentation of the quarterly exchange rate from 1990 to 2014. The figure shows that the real effective exchange rate has a fluctuating but positive trend from the first quarter of 1990 until the last quarter of 2014. The lowest depreciation rate illustrated by the figure was between the last quarter of 2001 and the first quarter of 2002, but the South African rand has maintained the positive trend throughout the period of the study.



**Figure 5.5: Private domestic investment**

Source: Own estimates based on data from SARB

Figure 5.5 illustrates the graphical representation of the quarterly private domestic investment in South Africa from 1990 to 2014. The graph shows that the private domestic investment, shown by the red line, has an upward trend but begins to experience a slight, sharp decline during the 2007-2010 period, which can be attributed to the world financial meltdown that occurred during that period. In the middle stages of 2010, the private domestic investment began to increase, mainly due to the 2010 FIFA World Cup that was hosted by the country. The world cup generated increased amounts of private domestic investments for the country.

Figure 5.4 and 5.5 shows the performance of the exchange rate and domestic private investment in South Africa between the first quarter of 1990 until the last quarter of 2014. The findings from Figure 5.4 the real effective exchange rate of South Africa has been experiencing a trend of fluctuations which may be attributed to the free-floating exchange rate regime that the South African economy has adopted. Figure 5.5 has shown that domestic private investment has been on the increase since the early 1990s, although it faced a slight decline during the 2007-2009 world financial crisis. This implies that domestic private investment has not been significantly affected by the performance of the exchange rate throughout the period of the study.

### 5.2.2.2 Descriptive analysis of real effective exchange rate and private domestic investment

**Table 5.12: Descriptive statistics of real effective exchange rate and private domestic investment**

	<b>EXCHANGE_RATE</b>	<b>PDI</b>
<b>Mean</b>	94.3398	289805.9
<b>Median</b>	94.74	183665.5
<b>Maximum</b>	111.62	784719
<b>Minimum</b>	63.11	61763
<b>Std. Dev.</b>	10.95621	225096.8
<b>Skewness</b>	-0.447417	0.744239
<b>Kurtosis</b>	2.507834	2.118384
<b>Jarque-Bera</b>	4.345654	12.47006
<b>Probability</b>	0.113855	0.00196
<b>Sum</b>	9433.98	28980592
<b>Sum Sq. Dev.</b>	11883.81	5.02E+12
<b>Observations</b>	100	100

Source: Own estimates based on data from SARB

Table 5.12 illustrates the results of the descriptive analysis conducted for the real effective exchange rate and private domestic investment. The results show that the average value of all observed exchange rate values is 94.33, and the average value of all observed private domestic investment values is 289805.9, which are expressed in millions. The standard deviation value of the real effective exchange rate is 10.956, which means that 10.956 is the average distance between the observed values and mean of the observed values. The average

distance between the observed values and the mean of the observed values for the private domestic investment is 2250196.8 million.

The skewness of the real effective exchange rate is -0.447, which means that the distribution for the real effective exchange rate is negatively skewed, or skewed to the left, while the distribution of the private domestic investment is positively skewed at 0.744, or skewed to the right. The kurtosis and the Jarque-Bera of the real effective exchange rate and the private domestic investment show that the distribution is not normally distributed, which is also confirmed by the probability of 11.38% and 0.196% respectively.

### 5.2.2.3 Correlation analysis of real effective exchange rate and private domestic investment

**Table 5.13 Cross correlation test of real effective exchange rate and private domestic investment**

Period	Lag	Lead
0	-0.4843	-0.4843
1	-0.46	-0.4674
2	-0.4322	-0.4455
3	-0.4038	-0.4175
4	-0.3721	-0.3805
5	-0.3397	-0.3473
6	-0.3089	-0.32
7	-0.2789	-0.2904
8	-0.2515	-0.27
9	-0.2278	-0.2532
10	-0.2057	-0.239

Source: Own estimates based on data from SARB

Table 5.13 illustrates the results obtained from the cross correlation test conducted for the real effective exchange rate and private domestic investment for the period between 1990 and 2014. The table shows that there is a negative relationship between the exchange rate and private domestic investment, which is illustrated by the negative values in the table. The relationship between the two variables is weak because of the small negative values in the table. This implies that there is no significant negative relationship between the two variables. However, in the long-run, this negative relationship will see the increase of one variable causing a decrease in the other variable.

#### 5.2.2.4 Stationarity tests of real effective exchange rate and private domestic investment

**Table 5.14: Unit root test of real effective exchange rate and private domestic investment**

		Level		1st Difference	
		RER	PDI	RER	PDI
<b>ADF</b>	<b>t-statistic</b>	-2.27	-0.1639	-5.435	-5.692
	<b>p-value</b>	0.1824	0.9380	0.000	0.000

Source: Own estimates based on data from SARB

Table 5.14 represents the Augmented Dickey-Fuller unit root test results for the real effective exchange rate and private domestic investment for the period of the study. The results show that the p-values of both the real effective exchange rate and private domestic investment, at level, are greater than the 0.05 significant level of these two variables, therefore the null hypothesis that RER and PDI has a unit root is accepted. This means that there is no stationarity at level for both of these variables. However, the p-values of the real effective exchange rate and private domestic investment, at 1<sup>st</sup> difference, become less than the 0.05 significance level, thus there exists stationarity for the two variables at 1<sup>st</sup> difference. These results show that the exchange rate and private domestic investment may be integrated, thus the co-integration test should be conducted.

### 5.2.2.5 Long-run relationship between real effective exchange rate and private domestic investment

Both the variables have proven to be I(1), thus the Vector Error Correction Model (VECM) can be estimated, but first the lag selection for the real effective exchange rate and private domestic investment needs to be selected as well as the co-integration test to determine the long-run relationship between the two variables.

**Table 5.15: Lag selection for real effective exchange rate and private domestic investment**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1531.679	NA	4.71E+12	34.85634	34.91265	34.87903
1	-1218.578	604.8547	4.19E+09	27.83131	28.00022	27.89936
2	-1198.325	38.20508	2.90E+09	27.46192	27.74344*	27.57534
3	-1191.172	13.16791*	2.70e+09*	27.39026*	27.78439	27.54905*
4	-1189.678	2.682349	2.86E+09	27.44722	27.95395	27.65137
5	-1186.737	5.145965	2.93E+09	27.4713	28.09063	27.72081
6	-1184.545	3.737315	3.06E+09	27.51238	28.24432	27.80726
7	-1183.253	2.143183	3.26E+09	27.57393	28.41847	27.91417
8	-1178.768	7.237148	3.23E+09	27.5629	28.52006	27.94852

Source: Own estimates based on data from SARB

Table 5.15 is the presentation of the results yielded by the lag length selection criterion test conducted for the real effective exchange rate and private domestic investment. From the table it can be seen that the Schwartz Information Criterion selected 2 lags, while the Hannan-Quinn Information Criterion, the Akaike Information Criterion and the Final Prediction Error all selected 3 optimal lags. Therefore, 3 optimal lags were selected for the

analysis of the relationship between the real effective exchange rate and private domestic investment in South Africa.

**Table 5.16: Johansen Co-integration test for real effective exchange rate and private domestic investment**

Hypothesized No. of CE(s)	Trace statistic		Maximum Eigen Value	
	Trace statistic	p-value	Trace statistic	p-value
None	14.481	0.021	14.054	0.015
At most 1	0.426	0.577	0.426	0.577

Source: Own estimates based on data from SARB

Table 5.16 depicts the results of the Johansen co-integration which were conducted for the real effective exchange rate and private domestic investment for the study period. The results from the table show that the p-values of the Trace statistic and the Maximum Eigen Value of no co-integrating equation are less than 0.05; meaning that at the 5 percent level of significance the null hypothesis for no co-integrating equation is rejected. However, the p-values of the Trace statistic and the Maximum Eigen Value of at most 1 co-integrating equation are more than 0.05; meaning that at the 5 percent level of significance, the null hypothesis for of at most 1 co-integrating equation is accepted. This means that there exists 1 co-integrating equation between the two variables; implying that there is a long-run relationship between the real effective exchange rate and private domestic investment in South Africa. Equation 5.2 below explains this long-run relationship.

$$\text{Ezchange\_Rate} = 5.4030 - 0.070440 \text{ Private\_Domestic} \quad (5.2)$$

Equation 5.2 shows the co-integrating equation, which shows that private domestic investment has a long-run negative effect on the real effective exchange rate. The equation above shows that, in the long-run, private domestic investment is negatively correlated to the exchange rate. This means that when the private domestic investment falls by 1% then the real effective exchange rate increases by approximately 7.044%. The existence of the 1 co-integrating equation means that the Vector Error Correction (VECM) can be estimated to capture the speed of adjustment to long-run equilibrium, which is the next test to be

conducted for the real effective exchange rate and private domestic investment for the duration of this study.

### 5.2.2.6 Short-run relationship between real effective exchange rate and private domestic investment

**Table 5.17: Short-run VECM results for real effective exchange rate and private domestic investment**

<b>Error Correction:</b>	<b>D(EXCHANGE_RAT)</b>	<b>D(DOMESTIC_INV)</b>
CointEq1	-0.161497	0.016156
	-0.06161	-0.02768
	[-2.62143]	[ 0.58362]
D(NEW_EXCHANGE_RATE(-1))	0.024182	-0.036976
	-0.10878	-0.04888
	[ 0.22229]	[-0.75644]
D(NEW_EXCHANGE_RATE(-2))	-0.126093	-0.029672
	-0.10422	-0.04683
	[-1.20989]	[-0.63360]
D(NEW_EXCHANGE_RATE(-3))	0.224294	-0.038312
	-0.1044	-0.04691
	[ 2.14845]	[-0.81670]
D(DOMESTIC_FIXED_INVEST(-1))	-0.218466	0.515

	-0.23758	-0.10675
	[-0.91955]	[ 4.82415]
D(DOMESTIC_FIXED_INVEST( -2))	-0.09168	-0.085881
	-0.2666	-0.11979
	[-0.34389]	[-0.71691]
D(DOMESTIC_FIXED_INVEST( -3))	0.124615	0.005508
	-0.23493	-0.10556
	[ 0.53045]	[ 0.05218]
C	0.002517	0.014732
	-0.00904	-0.00406
	[ 0.27838]	[ 3.62610]
R-squared	0.162619	0.257031

T-values in []

Source: Own estimates based on data from SARB

Table 5.17 represents the results of the Vector Error Correction which were conducted for the real effective exchange rate and private domestic investment for the period of the study. The results show that when the exchange rate is the dependent variable, then 1 co-integrating equation exists. The value of the error correction term has a significant negative coefficient (t-value > 1.96). This means that there exists a long-run relationship between the two variables which emerges from the exchange rate being the dependent variable. The error correction coefficient of 0.1614 means that approximately 16.14% of deviation from equilibrium is eliminated in every month of the year, and that the current growth in the real effective exchange rate is because of a result of the previous quarter's growth in both the real effective exchange rate and in the private domestic investment. Therefore, it takes the model

approximately 6.19 quarters to adjust to the full equilibrium, which suggests a short but slow adjustment to the equilibrium.

The exchange rate lags are not significant (t-values < 1.96) which implies that previous changes in the exchange rate have no effect on the current change in the exchange rate.

The exchange rate lags, in the private domestic investment equation, are also not significant (t-values < 1.96), meaning that past changes in the exchange rate has no effect on the current change in the private domestic investment. Therefore, short-run changes in the exchange rate have no effect on private domestic investment, and short-run changes in private domestic investment have no effect on the exchange rate.

The variance decomposition and the impulse response analysis are conducted to supplement thee results found by the short-run VECM test but first the autocorrelation and heteroscedasticity tests were conducted for the exchange rate and private domestic investment.

**Table 5.18: Autocorrelation LM test for real effective exchange rate and private domestic investment**

<b>Lags</b>	<b>LM-Stat</b>	<b>Prob.</b>
1	6.281004	0.1791
2	3.343923	0.502
3	1.633669	0.8027
4	5.650537	0.2268
5	0.605518	0.9624
6	3.192021	0.5262
7	4.451058	0.3484

Source: Own estimates based on data from SARB

Table 5.18 represents the results of the autocorrelation LM test which was conducted for the real effective exchange rate and private domestic investment for the study period. The table

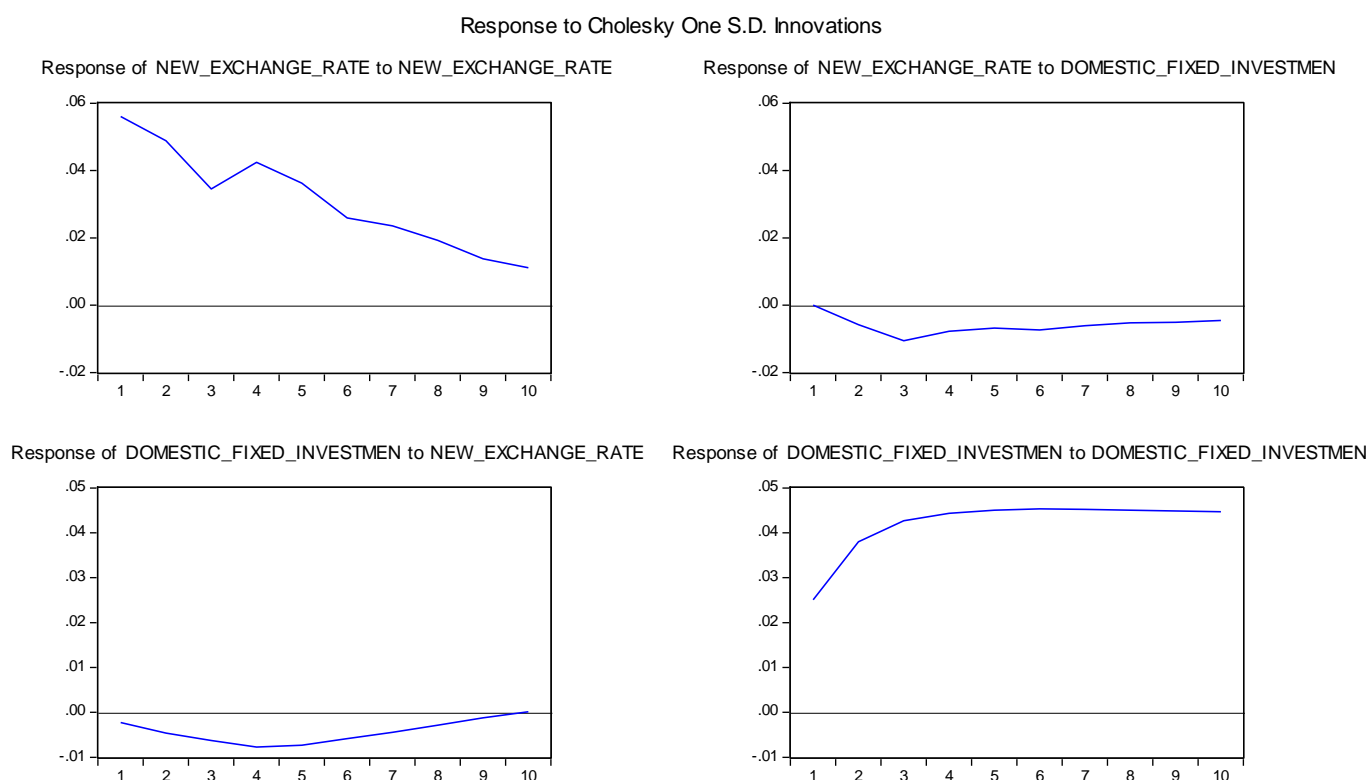
shows that seven lags were reported for this analysis. The results show that the probabilities of the LM-Stat were all greater than the 0.05 significance level, thus showing that the autocorrelation LM test was successful in the analysis between the real effective exchange rate and private domestic investment, therefore the model assesses the goodness-of-fit appropriately.

**Table 5.19: White heteroscedasticity test for real effective exchange rate and private domestic investment**

<b>Chi-sq</b>	<b>df</b>	<b>Prob.</b>
113.1858	105	0.2754

Source: Own estimates based on data from SARB

Table 5.19 illustrates the results of the white heteroscedasticity test with cross terms test which was conducted for the real effective exchange rate and private domestic investment for the period of the study. The table shows that the probability of Chi-square of 0.27 is greater than 0.05; meaning that, at the 5 percent level of significance, the null hypothesis that there is no heteroscedasticity is accepted. Therefore, there is no heteroscedasticity in VECM model used for analysis of the link between real effective exchange rate and credit extended to the domestic private sector variables. The next step in the analysis of the exchange rate and private domestic investment is the presentation of the findings of the variance decomposition and impulse response analysis.



**Figure 5.6: Impulse response analysis of real effective exchange rate and private domestic investment**

Source: Own estimates based on data from SARB

Figure 5.6 shows the results of the impulse response analysis that was conducted for the real effective exchange rate and private domestic investment from 1990 to 2014. The figure illustrates that the first graph shows that a shock in the exchange rate has a downward falling effect on the exchange rate in the first three periods, then increases sharply in the 4<sup>th</sup> period. This increase then declines in the 5<sup>th</sup> period throughout the period of the study. The second graph, which is the top right graph, shows that when there are changes in the private domestic investment then the exchange rate tends to be negative and declining during in the first three periods. The exchange rate increases slightly in the 4<sup>th</sup> period, and continues to increase throughout the period; however, this increase remains below the 0% point.

The bottom left graph shows the effect that shocks in the exchange rate has on private domestic investment. The graph shows that when there are shocks in the exchange rate, the private domestic investment tends to have a negative and falling effect during the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> periods. Private domestic investment increases slightly during the 4<sup>th</sup> period to shocks in the exchange rate, and continues to increase until the 10<sup>th</sup> period. The last graph (bottom

right) shows that changes in the private domestic investment tends to have a positive and increasing effect on private domestic investment.

The overall findings from the impulse response analysis shows that movements in the real effective exchange rate has a positive but declining effect on the exchange rate, while shocks in private domestic investment have a negative but slightly increasing effect on the exchange rate. Changes in the real effective exchange rate has a negative but increasing effect on private domestic investment, while shocks in the private domestic investment have a positive and increasing effect on private domestic investment. These findings show that the exchange rate and private domestic investment have an effect on each other, but not significantly. Thus, these results are similar to the findings obtained by the short-run VECM test for the exchange rate and private domestic investment.

**Table 5.20: Variance decomposition of real effective exchange rate**

Period	S.E.	EXCHANGE_RATE	DOMESTIC_INVEST
1	0.056028	100	0
2	0.074563	99.40275	0.597253
3	0.082833	97.90032	2.099683
4	0.093386	97.65289	2.34711
5	0.100402	97.50572	2.494281
6	0.103959	97.17197	2.828032
7	0.106773	96.99055	3.009447
8	0.108628	96.85891	3.141086
9	0.109619	96.70018	3.299815
10	0.110277	96.56836	3.431642

Source: Own estimates based on data from SARB

Table 5.20 illustrates the results of the variance decomposition test that was conducted for the real effective exchange rate. The table shows that without considering the contribution of the

real effective exchange rate, the contribution of the private domestic investment starts off at 0% in the 1<sup>st</sup> period, and continues to increase throughout the periods, until reaching a maximum of 3.43% in the 10<sup>th</sup> period. This suggests that private domestic investment contributes to the real effective exchange rate, but not significantly, thus the private domestic investment does not seem to contribute to short-run changes in the real effective exchange rate.

**Table 5.21: Variance decomposition of private domestic investment**

Period	S.E.	EXCHANGE_RATE	DOMESTIC_INVEST
1	0.025176	0.828318	99.17168
2	0.045828	1.275266	98.72473
3	0.062941	1.667409	98.33259
4	0.077385	2.110682	97.88932
5	0.089845	2.231415	97.76858
6	0.100795	2.11131	97.88869
7	0.110561	1.919027	98.08097
8	0.119412	1.703486	98.29651
9	0.127566	1.502195	98.4978
10	0.135163	1.338141	98.66186

Source: Own estimates based on data from SARB

Table 5.21 above represents the results of the variance decomposition test which was conducted for the private domestic investment for the period of the study. The table shows that without the contribution of the private domestic investment, the contribution of the real effective exchange rate starts off at 0.82% in the 1<sup>st</sup> period then increases to a high of 2.23% in the 5<sup>th</sup> period. This then falls to 2.11% in the 6<sup>th</sup> period and continues the falling trend until the 10<sup>th</sup> period, with a value of 1.33%. This suggests that the exchange rate contributes to the private domestic investment but not significantly.

The overall results of the variance decomposition of both the real effective exchange rate and private domestic investment show that there is no significant contribution that these two variables add or deduct from each other in the short-run. These results are, therefore, consistent with the results found from the short-run VECM test and the impulse response analysis, in the sense that there seems to be no significant short-run relationship between the real effective exchange rate and private domestic investment.

**Table 5.22: Granger causality test of real effective exchange rate and private domestic investment**

<b>Null Hypothesis:</b>	<b>F-Statistic</b>	<b>Prob.</b>
$\Delta$ DOMESTIC_INVESTMENT does not Granger Cause $\Delta$ RER	1.3137	0.2749
$\Delta$ RER does not Granger Cause $\Delta$ DOMESTIC_INVESTMENT	0.15137	0.9286

Source: Own estimates based on data from SARB

Table 5.22 represents the results obtained from the Granger causality test that was conducted for the real effective exchange rate and private domestic investment for the period of the study. The table shows that the null hypothesis that the private domestic investment does not Granger cause the real effective exchange rate is accepted at the 5 percent significance level ( $p > 0.05$ ). Similarly, the null hypothesis that the real effective exchange rate does not Granger cause private domestic investment is accepted at the 5 percent level of significance ( $p > 0.05$ ). These results imply that there is no causal relationship between the real effective exchange rate and private domestic investment between the study period of 1990 – 2014.

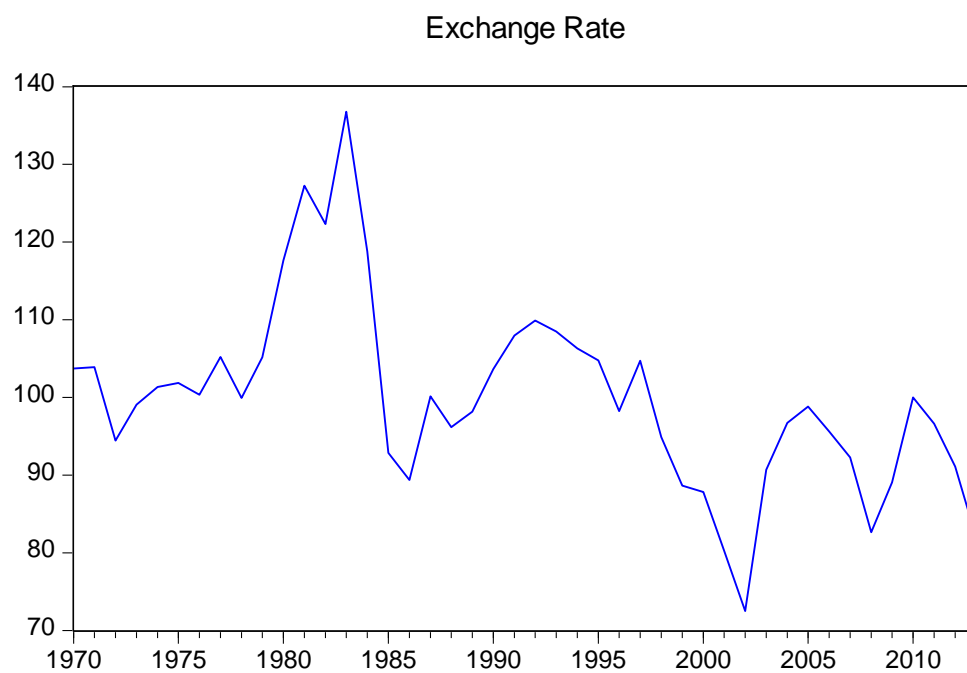
The results found from the Granger causality test are confirmed by the results found by the variance decomposition, the impulse response analysis and the VECM, which showed that the real effective exchange rate and private domestic investment do have an effect on each other in the short-run, however, the effect is not significant. Thus, these two variables are not interlinked together in the short-run, but there is a relationship between the two variables in the long-run.

### 5.2.3 Analysis of the link between real effective exchange rate and foreign direct investment

The exchange rate is expected to be linked to foreign direct investment because foreign investors make investments in countries that have economical potential and countries with environments that encourage and wish to maintain foreign investments. Therefore, the tests from this sub-section are expected to yield results that show that the behaviour of the exchange rate is linked to the performance of foreign direct investment in South Africa.

The presentation of the results starts off with the graphical and descriptive analysis of the exchange rate and foreign direct investment, followed by the correlation analysis between the two variables. The stationarity tests follow thereafter, thus followed by the long-run and short-run relationship tests of the exchange rate and foreign direct investment.

#### 5.2.3.1 Graphical analysis of real effective exchange rate and foreign direct investment

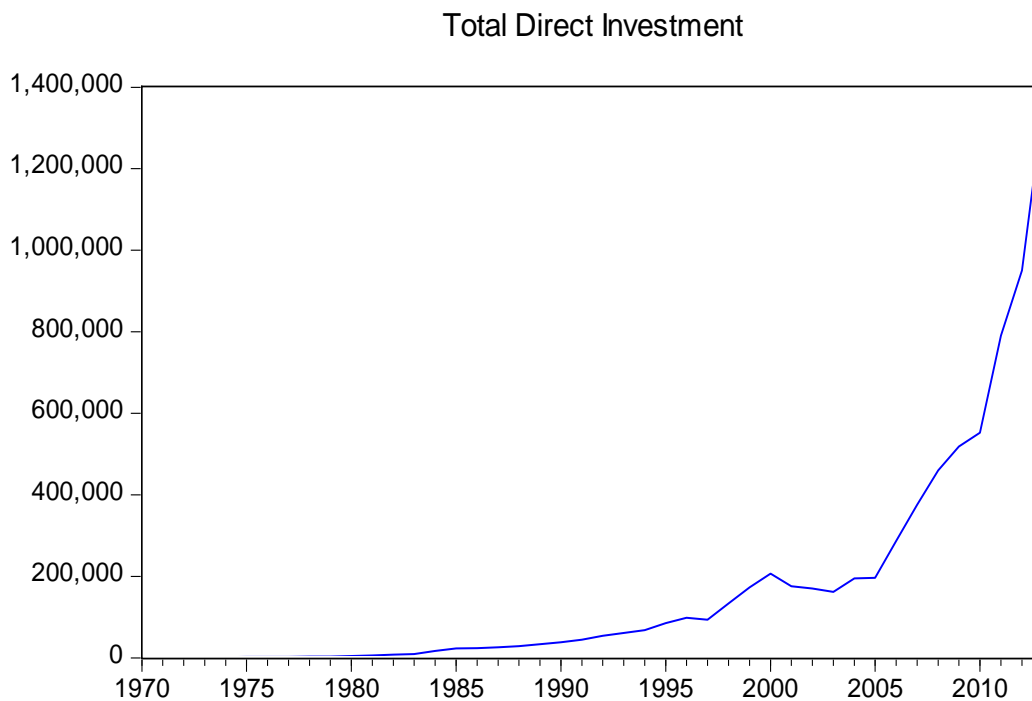


**Figure 5.7: Exchange rate**

Source: Own estimates based on data from SARB

Figure 5.7 represents the graphical illustration of the yearly exchange rate from 1970 until 2013. The graph shows a fluctuating trend of the exchange rate throughout the study period, with the highest appreciation of the exchange rate being recorded in 1984 and the lowest

depreciation point being recorded in 2002. This graph is a perfect representation of the manner in which a free-floating exchange rate reacts to market forces of the global economy.



**Figure 5.8: Foreign direct investment**

Source: Own estimates based on data from SARB

Figure 5.8 represents the graphical analysis of the yearly foreign direct investment from 1970 until 2013. The graph shows that foreign direct investment was at its lowest point during the 1970s until the early 1980s. Between 1985 and 1996, foreign direct investment began to slightly grow, and peaked up in 2000 reaching a value of 200 000, represented in millions. However, foreign direct investment dropped slightly during the beginning of 2002 but managed to gain momentum again from 2005 until 2013.

Figure 5.7 and 5.9 shows the performance trend of the real effective exchange rate and foreign direct investment in South Africa from 1970 to 2013. Figure 5.7 shows that the exchange rate has been going through a fluctuating trend since the beginning of the study period, however, the fluctuating behaviour of the exchange rate seems to have not deterred the manner in which foreign direct investment has grown in the country. Thus, these two figures imply that shocks in the exchange rate do not significantly affect the performance of foreign direct investment in South Africa.

### 5.2.3.2 Descriptive analysis of real effective exchange rate and foreign direct investment

**Table 5.23: Descriptive statistics of real effective exchange rate and foreign direct investment**

	<b>EXCHANGE_RATE</b>	<b>FOREIGN_DIRECT_INVEST</b>
<b>Mean</b>	99.955	169002.8
<b>Median</b>	99.5	49250
<b>Maximum</b>	136.78	1349855
<b>Minimum</b>	72.5	869
<b>Std. Dev.</b>	12.16117	281165.2
<b>Skewness</b>	0.638015	2.546943
<b>Kurtosis</b>	4.234469	9.617626
<b>Jarque-Bera</b>	5.778976	127.8578
<b>Probability</b>	0.055605	0
<b>Sum</b>	4398.02	7436125
<b>Sum Sq. Dev.</b>	6359.447	3.40E+12
<b>Observations</b>	44	44

Source: Own estimates based on data from SARB

Table 5.23 represents the results of the descriptive analysis conducted for the real effective exchange rate and foreign direct investment for the period of the study. The table shows that the average values of all observed values of the real effective exchange rate is 99.955, while for the foreign direct investment the average value of all observed values is 169002.8, which is expressed in millions. The standard deviation of the real effective exchange rate shows that the distance between the observed values and the mean of all the observed values is 12.16, while for the foreign direct investment, the distance is 281165.2 million.

The table also shows that the skewness of both the variables is positively skewed, or skewed to the right. The kurtosis and the Jarque-Bela tests for both variables show that the distribution is not normally distributed, which is also confirmed by the low values of the probabilities of both the variables.

### 5.2.3.3 Correlation analysis of real effective exchange rate and foreign direct investment

**Table 5.24: Cross correlation of real effective exchange rate and foreign direct investment**

Period	Lag	Lead
0	-0.4459	-0.4459
1	-0.3573	-0.3398
2	-0.2943	-0.3046
3	-0.2393	-0.3253
4	-0.209	-0.4088
5	-0.1782	-0.4138
6	-0.1525	-0.336
7	-0.1317	-0.3226
8	-0.1095	-0.3337
9	-0.099	-0.3986
10	-0.0772	-0.4654

Source: Own estimates based on data from SARB

Table 5.24 represents the results obtained from the cross correlation of the real effective exchange rate and foreign direct investment from 1970 until 2013. The table indicates that there is a negative relationship between the real effective exchange rate and foreign direct investment during the period of the study. This negative relationship also seems to be weak, as indicated by the low values in the table, which implies that the presence of the relationship between the two variables is small. Therefore, it can be concluded that has been a weak,

negative relationship between the exchange rate and foreign direct investment in South Africa from 1970 until 2013. This negative relationship implies when one variable increases then the other variable decreases in the long-run.

#### 5.2.3.4 Stationarity tests of real effective exchange rate and foreign direct investment

**Table 5.25: Unit root test of real effective exchange rate and foreign direct investment**

		Level		1st difference	
		RER	FDI	RER	FDI
<b>ADF</b>	<b>t-statistic</b>	-2.134	-0.444	-5.596	-5.297
	<b>p-value</b>	0.232	0.8919	0.000	0.000

Source: Own estimates based on data from SARB

Table 5.25 above illustrates the results of the Augmented Dickey-Fuller unit root test for the study period. These results show that the p-values of both the real effective exchange rate and the foreign direct investment at level are greater than the 0.05 significance level of these two variables. This means that the null hypothesis is accepted, meaning that there is no stationarity with regards to these two variables at level. However, there exists stationarity at 1<sup>st</sup> difference for both the real effective exchange rate and foreign direct investment. These two variables both have a unit root.

These results show that both the exchange rate and foreign direct investment have a unit root at level and become stationary at 1<sup>st</sup> difference. The two variables are I(1), which implies that there is a possibility of co-integration between the two variables. Thus, the need for the results of the co-integration test to be presented. But before the results of the co-integration test are presented, the number of lags in the model need to be identified first with the information criteria being used to select the optimal number of lags to be used in the analysis of the exchange rate and foreign direct investment.

#### 5.2.3.5 Long-run relationship between real effective exchange rate and foreign direct investment

**Table 5.26: Lag selection for real effective exchange rate and foreign direct investment**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-572.574	NA	1.35E+13	35.91088	36.00249	35.94125
1	-495.516	139.6681	1.41E+11	31.34474	31.61957*	31.43584
2	-492.219	5.564349	1.48E+11	31.38866	31.8467	31.54048
3	-490.845	2.145582	1.76E+11	31.55283	32.19409	31.76539
4	-483.773	10.16582	1.47E+11	31.36084	32.18532	31.63413
5	-483.371	0.528481	1.90E+11	31.58567	32.59337	31.9197
6	-478.266	6.06149	1.84E+11	31.51665	32.70756	31.9114
7	-466.281	12.73452*	1.19E+11	31.01756	32.39169	31.47304
8	-458.749	7.061024	1.04e+11*	30.79682	32.35417	31.31304

Source: Own estimates based on data from SARB

Table 5.26 illustrates the results of the lag length selection criterion for the real effective exchange rate and foreign direct investment for the study period. From the table it can be seen that the selected lag is 1 optimal lag, which was selected by the Schwartz Information Criterion. The other criterion, namely the Akaike Information Criterion (AIC) and the Hannan-Quinn Information Criterion (HQ) selected no lag in the analysis of the exchange rate and foreign direct investment.

**Table 5.27: Johansen Co-integration test of real effective exchange rate and foreign direct investment**

Hypothesized No. of CE(s)	Trace Statistic		Maximum Eigen Value	
	Trace statistic	p-value	Trace statistic	p-value
None	21.665	0.001	21.538	0.0006
At most 1	0.128	0.768	0.128	0.7684

Source: Own estimates based on data from SARB

Table 5.27 illustrates the results of the Johansen co-integration tests for the real effective exchange rate and foreign direct investment from 1970 until 2013. The results show that the p-values of the Trace statistic and the Maximum Eigen Value of no co-integrating equation are less than 0.05; meaning that at the 5 percent level of significance the null hypothesis for no co-integrating equation is rejected. However, the p-values of the Trace statistic and the Maximum Eigen Value of at most 1 co-integrating equation are more than 0.5; meaning that at the 5 percent level of significance, the null hypothesis for of at most 1 co-integrating equation is accepted. This means that there exists 1 co-integrating equation between the two variables; implying that there is a long-run relationship between the real effective exchange rate and private domestic investment in South Africa. Equation 5.3 below explains this long-run relationship.

$$\text{Exchange\_Rate} = 4.8687 - 0.025476 \text{ Foreign Direct Investment} \quad (5.3)$$

Equation 5.3 shows the co-integrating equation, which shows that foreign direct investment has a long-run negative effect on the real effective exchange rate. The equation above shows that, in the long-run, foreign direct investment is negatively correlated to the exchange rate. This means that when the foreign direct investment falls by 1% then the real effective exchange rate increases by approximately 2.55%. The existence of the 1 co-integrating equation means that the Vector Error Correction (VECM) can be estimated to capture the speed of adjustment to long-run equilibrium, which is the next test to be conducted for the real effective exchange rate and foreign direct investment for the duration of this study.

### 5.2.3.6 Short-run relationship between exchange rate and foreign direct investment

**Table 5.28: Short-run VECM results for real effective exchange rate and foreign direct investment**

<b>Error Correction:</b>	<b>D(EXCHANGE_RATE)</b>	<b>D(FDI)</b>
CointEq1	-0.369077	0.782018
	-0.14999	-0.23025
	[-2.46061]	[ 3.39637]
D(EXCHANGE_RATE(-1))	0.236814	0.11535
	-0.18285	-0.28069
	[ 1.29511]	[ 0.41095]
D(FDI(-1))	-0.070903	-0.04518
	-0.11116	-0.17063
	[-0.63787]	[-0.26478]
C	0.006883	0.180296
	-0.02173	-0.03336
	[ 0.31676]	[ 5.40478]
R-squared	0.251224	0.354711

T-values in []

Source: Own estimates based on data from SARB

Table 5.28 represents the results of the short-run VECM test which was conducted for the real effective exchange rate and foreign direct investment. The table shows that when the

exchange rate is the dependent variable, then 1 co-integrating equation exists. The error correction term has a significant but negative coefficient (t-values  $> 1.96$ ), which means that a long-run relationship between the exchange rate and foreign direct investment that emerges when the exchange rate is the dependent variable. The value of the error correction coefficient of 0.369 means that approximately 36.9% of deviation from equilibrium is eliminated in every month of the year, and that the current growth in the real effective exchange rate is because of a result of the previous quarter's growth in both the real effective exchange rate and in the private domestic investment. The model takes approximately 2.7 years to adjust to full equilibrium, suggesting a slow adjustment to the equilibrium.

The exchange lags are not significant (t-values  $< 1.96$ ), meaning that past changes in the real effective exchange rate have no effect on the current changes in the real effective exchange rate. Thus, short-term changes in the real effective exchange rate have no effect on the real effective exchange rate.

In the foreign direct investment, the lags of the exchange rate are not significant (t-values  $< 1.96$ ), meaning that previous changes in the real effective exchange rate have no effect on current changes in the foreign direct investment. Therefore, it can be concluded that short-run changes in the real effective exchange rate have no effect on foreign direct investment in South Africa.

The variance decomposition and the impulse response analysis will be presented to supplement the findings obtained from the short-run VECM test. The diagnostic tests, which include the autocorrelation and heteroscedasticity tests, are presented to confirm if the VECM meets all the econometric assumptions.

**Table 5.29: Autocorrelation LM test for real effective exchange rate and foreign direct investment**

<b>Lags</b>	<b>LM-Stat</b>	<b>Prob.</b>
1	3.734259	0.4432
2	3.042166	0.5508
3	4.148267	0.3863
4	2.993678	0.5589
5	8.080014	0.0887
6	3.599283	0.4629
7	1.649417	0.7999

Source: Own estimates based on data from SARB

Table 5.29 represents the results of the autocorrelation LM test that was conducted for the real effective exchange rate and foreign direct investment for the period of the study. The table shows that there were 7 lags which the test was conducted for. The p-values of the LM-Stat for all the lags are greater than the 5 percent significance level, thus meaning that the test for autocorrelation was successful for the analysis of the real effective exchange rate and foreign direct investment.

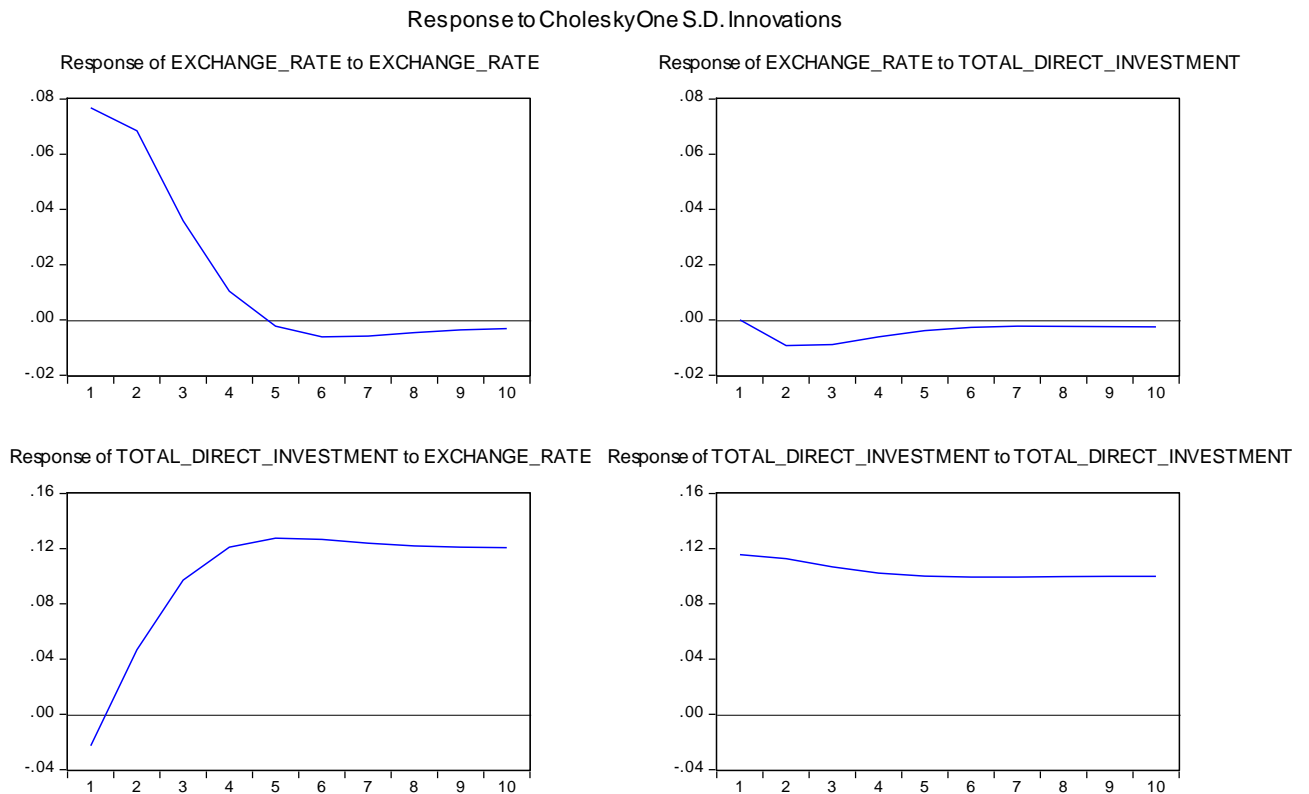
**Table 5.30: White heteroscedasticity test of real effective exchange rate and foreign direct investment**

<b>Chi-sq</b>	<b>df</b>	<b>Prob.</b>
37.48361	27	0.0864

Source: Own estimates based on data from SARB

Table 5.30 illustrates the results of the heteroscedasticity test that was conducted for the real effective exchange rate and foreign direct investment for the period of the study. The table

shows that the probability of Chi-square of 0.08 is greater than 0.05; meaning that, at the 5 percent level of significance, the null hypothesis that there is no heteroscedasticity is accepted. Therefore, there is no heteroscedasticity in VECM model used for analysis of the link between real effective exchange rate and foreign direct investment variables. Thus, the impulse response analysis follows to supplement these results.



**Figure 5.9: Impulse response analysis of real effective exchange rate and foreign direct investment**

Source: Own estimates based on data from SARB

Figure 5.9 above represents the results obtained from the impulse response analysis for the real effective exchange rate and foreign direct investment from 1970 until 2013. The figure shows that when there are shocks in the real effective exchange rate then the effect that this has on the real effective exchange rate is one of a downward spiralling effect, which is shown by the top left graph. The real effective exchange rate started declining in the 2<sup>nd</sup> period, and continued to decline throughout the period. This downward spiral started steadying in the 6<sup>th</sup> period, and maintained consistent trend until the 10<sup>th</sup> period. However, the effect that changes in foreign direct investment have on the real effective exchange rate is that of a negative but

increasing trend, which is shown by the top right graph. This increasing trend, however, does not go above the 0% point.

Shocks in the real effective exchange rate have an upward trending effect on foreign direct investment, with the increase sharpening in the 4<sup>th</sup> period. Shocks in foreign direct investment have a positive, but seemingly declining effect on foreign direct investment. These results indicate that shocks in the real effective exchange rate has a more significant effect on both the real effective exchange rate and foreign direct investment, while the real effective exchange rate and foreign direct investment reacts in a less significant manner to shocks in the foreign direct investment.

**Table 5.31: Variance decomposition of real effective exchange rate**

Period	S.E.	EXCHANGE_RATE	FDI
1	0.076771	100	0
2	0.103265	99.19116	0.808835
3	0.10967	98.62259	1.377406
4	0.110333	98.33189	1.668109
5	0.110423	98.21393	1.786069
6	0.110624	98.16244	1.837558
7	0.110805	98.12563	1.87437
8	0.110925	98.08682	1.91318
9	0.111011	98.04287	1.957128
10	0.111083	97.99502	2.004978

Source: Own estimates based on data from SARB

Table 5.31 illustrates the results of the variance decomposition of the real effective exchange rate for the study period. The results show that without the contribution of the real effective exchange rate, the contribution of foreign direct investment to the real effective exchange rate begins at a rate of 0% in the 1<sup>st</sup> period, and increases until it reaches a maximum value of

2.00% in the 10<sup>th</sup> period. This implies that the contribution of foreign direct investment to the real effective exchange rate is not significant, thus it can be concluded that foreign direct investment does not contribute to short-run changes in the real effective exchange rate.

**Table 5.32: Variance decomposition of foreign direct investment**

Period	S.E.	EXCHANGE_RATE	FDI
1	0.117848	3.698971	96.30103
2	0.169664	9.393008	90.60699
3	0.222765	24.46812	75.53188
4	0.273381	35.86163	64.13837
5	0.317849	42.6495	57.3505
6	0.356277	46.57345	53.42655
7	0.39011	48.941	51.059
8	0.420708	50.48551	49.51449
9	0.449008	51.58518	48.41482
10	0.475575	52.42761	47.57239

Source: Own estimates based on data from SARB

Table 5.32 represents the results of the variance decomposition conducted for the foreign direct investment for the period of the study. The results show that without the contribution of foreign direct investment, the contribution of the real effective exchange rate to foreign direct investment is one of an increasing trend. The maximum value at which the real effective exchange rate contributes to the foreign direct investment is 52.43% in the 10<sup>th</sup> period. Thus, it can be concluded that the real effective exchange rate contributes to variance in the foreign direct investment, implying that real exchange rate has short-run effect on the foreign direct investment.

Overall, the results of the variance decomposition for both the effective exchange rate and foreign direct investment shows that these two variables both have an effect on each other in

the short-run, but the effective exchange rate has a more significant contribution to foreign direct investment than the contribution of foreign direct investment on the effective exchange rate.

**Table 5.33: Granger causality test of real effective exchange rate and foreign direct investment**

<b>Null Hypothesis:</b>	<b>F-Statistic</b>	<b>Prob.</b>
$\Delta$ DIRECT_INVESTMENT does not Granger Cause $\Delta$ RER	3.91987	0.0546
$\Delta$ RER does not Granger Cause $\Delta$ DIRECT_INVESTMENT	21.4428	0.00004.

Source: Own estimates based on data from SARB

Table 5.33 represents the results of the Granger causality test, which was conducted for the real effective exchange rate and foreign direct investment for the period of the study. The results show that there exists a one-way causal relationship between the real effective exchange rate and foreign direct investment. This one-way causal relationship is shown by the value of the F-statistic being greater than the 5 percent significance level. This means that the change in the real effective exchange rate Granger causes foreign direct investment, but the change in the foreign direct investment does not Granger cause the real effective exchange rate.

These results are consistent with the results found by the VECM test and the variance decomposition tests, in that there is a one-way causal relationship between the real effective exchange rate and foreign direct investment and the real effective exchange rate has a more significant effect on foreign direct investment

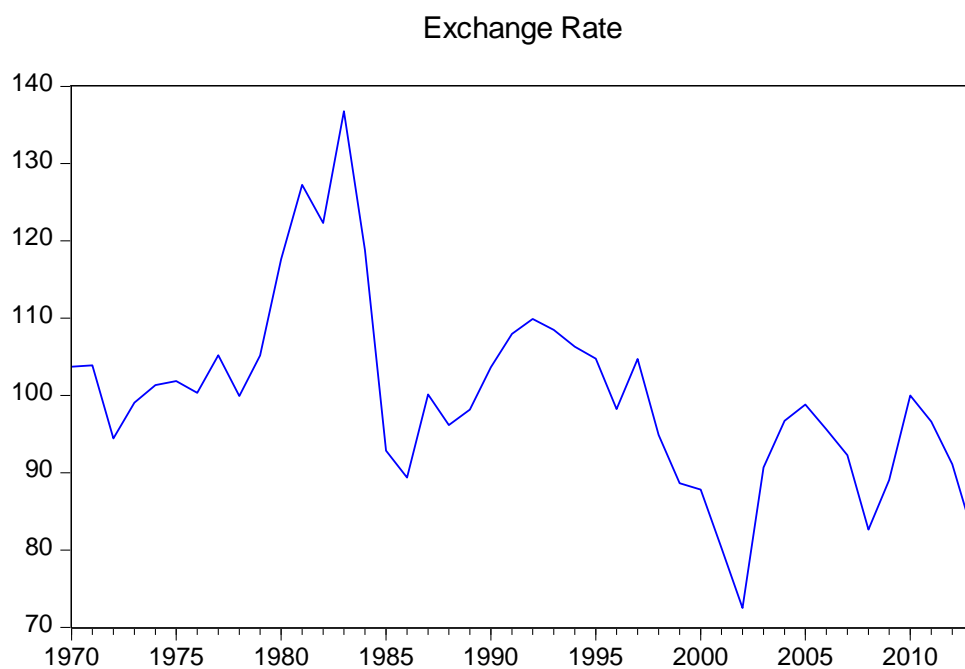
#### **5.2.4 Analysis of the link between real effective exchange rate and foreign portfolio investment**

The exchange rate is expected to be linked to foreign portfolio investment because foreign portfolio investors tend to make investments in countries that have a stable exchange rate, and have the potential of yielding high rates of returns on their investments. This sub-section

aims to show that there exists a relationship between the behaviour of the exchange rate and the performance of foreign portfolio investment in South Africa.

The results of the analysis of the link between the exchange rate and foreign portfolio investment start off with the presentation of the graphical and the descriptive analysis of the two variables. The presentation of the results then proceeds on with the results of the correlation analysis between the exchange rate and foreign portfolio investment. These results are then followed by the findings of the stationarity tests, thereafter the long-run and short-run relationship findings are presented, which includes the VECM test results and the results obtained from the co-integration, impulse response analysis and the variance decomposition tests.

#### 5.2.4.1 Graphical analysis of real effective exchange rate and foreign portfolio investment

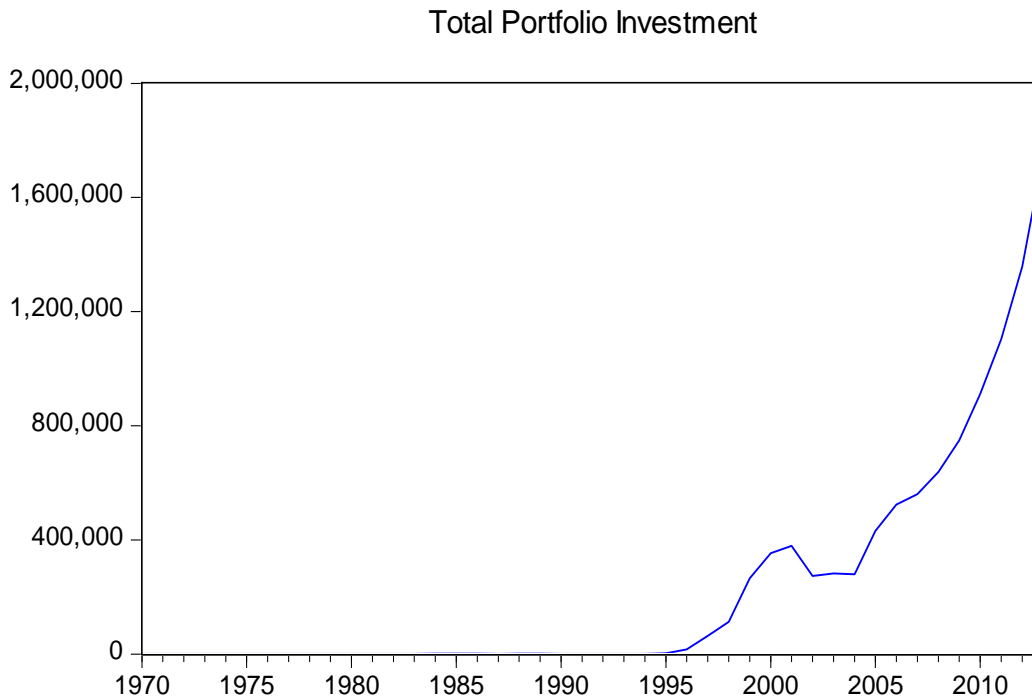


**Figure 5.10: Exchange rate**

Source: Own estimates based on data from SARB

Figure 5.10 represents the graphical illustration of the yearly exchange rate for the period of 1970 to 2013. The figure shows that the real effective exchange rate of South Africa has had a fluctuating trend since the beginning of the study period, throughout the conclusion of the study. The figure illustrates that the highest point of appreciation recorded between the study

period 1970 to 2013 was during 1983, with the lowest point of depreciation recorded being experienced in 2002. Thereafter, the South African rand has maintained a fluctuating trend throughout.



**Figure 5.11: Foreign portfolio investment**

Source: Own estimates based on data from SARB

Figure 5.11 illustrates the graphical analysis of the yearly foreign portfolio investment in South Africa from 1970 to 2013. The figure shows that foreign portfolio investment was at the R0 (millions) during the 1970s throughout the early 1990s. Foreign portfolio investment started to grow in 1995, and has been growing up until 2002, where foreign portfolio investment experienced a slight fall. This may be attributed to the lowest rate of depreciation of the South African exchange rate during 2002. However, after 2002, foreign portfolio investment began to stabilise again, reaching R400 000 (millions) in 2006. This upward growth in the foreign portfolio investment has been maintained throughout the rest of the period of the study.

Figure 5.10 and 5.11 shows the trend of the performance of the real effective exchange rate and foreign portfolio investment in South Africa from 1970 to 2014. Figure 5.10 shows that the exchange rate experienced the lowest rate of depreciation in 2002, which put a strain on the performance of foreign portfolio investment, as seen in Figure 5.11. This means that there

is a possibility that the behaviour of the exchange rate may have an effect on the performance of the foreign portfolio investment in South Africa. Thus, there may exist a relationship between the exchange rate and foreign portfolio investment.

#### 5.2.4.2 Descriptive analysis of real effective exchange rate and foreign portfolio investment

**Table 5.34: Descriptive statistics of real effective exchange rate and foreign portfolio investment**

	<b>EXCHANGE_RATE</b>	<b>TOTAL_PORTFOLIO_INVESTME</b>
<b>Mean</b>	99.955	228841.5
<b>Median</b>	99.5	1218.5
<b>Maximum</b>	136.78	1749411
<b>Minimum</b>	72.5	159
<b>Std. Dev.</b>	12.16117	402905
<b>Skewness</b>	0.638015	2.123578
<b>Kurtosis</b>	4.234469	7.198635
<b>Jarque-Bera</b>	5.778976	65.38927
<b>Probability</b>	0.055605	0
<b>Sum</b>	4398.02	10069027
<b>Sum Sq. Dev.</b>	6359.447	6.98E+12
<b>Observations</b>	44	44

Source: Own estimates based on data from SARB

Table 5.34 represents the results obtained from the descriptive analysis between the real effective exchange rate and foreign portfolio investment for the period of the study. The table shows that the average value of all exchange rate observations is 95.96, and the average value

of all the foreign portfolio investment values is 228841.5, expressed in millions. The standard deviation yielded by the exchange rate is 12.16, which means that 12.16 is the average distance between the observations and mean of the observations, and for the foreign portfolio investment, the value of the standard deviation is 402905 million. The skewness for the exchange rate shows that the distribution is skewed to the right, which is also referred to as being positively skewed. The skewness of the foreign portfolio investment distribution is skewed to the right, or positively skewed. The kurtosis and Jacque-Bera tests check for normality in the distribution. With regards to the exchange rate and foreign portfolio investment, the kurtosis and Jacque-Bera tests show that the variables are not normally distributed. This is also confirmed by the small value of the probabilities of both the variables.

#### **5.2.4.3 Correlation analysis of real effective exchange rate and foreign portfolio investment**

**Table 5.35 Cross correlation test of real effective exchange rate and foreign portfolio investment**

<b>Period</b>	<b>Lag</b>	<b>Lead</b>
0	-0.4722	-0.4722
1	-0.4023	-0.3861
2	-0.3328	-0.3587
3	-0.2679	-0.3878
4	-0.1999	-0.4595
5	-0.1594	-0.4457
6	-0.1379	-0.3608
7	-0.128	-0.3457
8	-0.1032	-0.3575
9	-0.0746	-0.4155
10	-0.0506	-0.4794

Source: Own estimates based on data from SARB

Table 5.35 illustrates the results obtained from the cross correlation test conducted for the real effective exchange rate and foreign portfolio investment for the period of 1970 to 2013. The table shows that there is a negative relationship between the real effective exchange rate and foreign portfolio investment. This negative relationship also seems to be weak, as illustrated by the small values found in the table. This weak, negative relationship between the two variables means that an increase in one variable will result in a fall in the other variable.

#### 5.2.4.4 Stationarity tests of real effective exchange rate and foreign portfolio investment

**Table 5.36: Unit root test of real effective exchange rate and foreign portfolio investment**

		Level		1st difference	
		RER	FPI	RER	FPI
<b>ADF</b>	<b>t-statistic</b>	-2.581	-0.577	-2.495	-3.504
	<b>p-value</b>	0.105	0.865	0.014	0.013

Source: Own estimates based on data from SARB

Table 5.36 illustrates the results obtained from the Augmented Dickey-Fuller unit root test conducted for the real effective exchange rate and foreign portfolio investment for the period of the study. The table shows that at level, the p-values of the real effective exchange rate (RER) is 0.105 which is greater than the 0.05; meaning that the null hypothesis that RER has a unit root is accepted at the 5 percent level of significance. This means that RER is not stationary at level. However, at 1<sup>st</sup> difference, the p-value of the real effective exchange rate is 0 (p-value < 0.05); meaning that the null hypothesis for unit in RER is rejected at the 5 percent level of significance. . Therefore the real effective exchange rate is stationary at 1<sup>st</sup> difference, implying that it I(1).

The results of the unit root test for the foreign portfolio investment variable shows that at level indicate the p-value is greater than 0.05, meaning that, at the 5 percent level of significance, the null hypothesis that foreign portfolio investment has a unit root is accepted. At 1<sup>st</sup> difference, however, the foreign portfolio investment becomes stationary as the null

hypothesis is rejected at the 5 percent level of significance ( $p$ -value  $< 0.05$ ). This means that the Credit Extended is stationarity at 1<sup>st</sup> difference. These results show that both the two variables have a unit root at level but become stationary at 1<sup>st</sup> difference. Thus both the variables are I(1). This means that there is a possibility that the two variables may be integrated; thus, the co-integration test should be conducted next.

#### 5.2.4.5 Long-run relationship between real effective exchange rate and foreign portfolio investment

Since the variables have proven to be I(1), the multivariate Johansen co-integration test can be used. Before conducting the co-integration test the number of lags in the model should be identified, the information criteria were used to select the optimal number of lags to be used.

**Table 5.37: Lag selection for real effective exchange rate and foreign portfolio investment**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-436.0498	NA	2.66E+09	27.37811	27.46972	27.40848
1	-355.9861	145.1154	22964994	22.62413	22.89896*	22.71523
2	-350.8609	8.648709	21492545	22.55381	23.01185	22.70564*
3	-348.6699	3.423556	24287783	22.66687	23.30813	22.87943
4	-341.0815	10.90834*	19736743*	22.44259*	23.26707	22.71588
5	-339.0836	2.622189	22984396	22.56772	23.57542	22.90175
6	-337.6876	1.657802	28181183	22.73047	23.92138	23.12523
7	-334.8574	3.007091	32174952	22.80358	24.17771	23.25907
8	-333.1622	1.589205	40403358	22.94764	24.50498	23.46385

Source: Own estimates based on data from SARB

Table 5.37 illustrates the results of the Lag Selection Criterion conducted for the real effective exchange rate and foreign portfolio investment for the period of the study. The table shows that the Hannan-Quinn Information Criterion (HQ) selected 2 optimal lags. The Schwartz Information Criterion (SC) selected one optimal lag, while the Akaike Information Criterion (AIC) and the Final Prediction Error (FPE) both selected 4 optimal lags. Therefore, 4 optimal lags were selected for the analysis of the real effective exchange rate and foreign portfolio investment.

**Table 5.38: Johansen Co-integration test of real effective exchange rate and foreign portfolio investment**

Hypothesized No. of CE(s)	Trace Statistic		Maximum Eigen Value	
	Trace statistic	p-value	Trace statistic	p-value
None	14.073	0.025	14.073	0.015
At most 1	6.31E	0.996	6.31E	0.996

Source: Own estimates based on data from SARB

Table 5.38 represents the results obtained from the Johansen co-integration test conducted for the real effective exchange rate and foreign portfolio investment for the period of the study. The results show that the p-values of the Trace statistic and the Maximum Eigen Value of no co-integrating equation are less than 0.05; meaning that at the 5 percent level of significance the null hypothesis for no co-integrating equation is rejected. However, the p-values of the Trace statistic and the Maximum Eigen Value of at most 1 co-integrating equation are more than 0.05; meaning that at the 5 percent level of significance, the null hypothesis for of at most 1 co-integrating equation is accepted. This means that there exists 1 co-integrating equation between the two variables; implying that there is a long-run relationship between the real effective exchange rate and the foreign portfolio investment. The equation that describes this long-run relationship is shown by equation 5.4 below.

$$\text{Exchange\_Rate} = 4.816485 - 0.00000101 \text{ Foreign Portfolio Investment} \quad (5.4)$$

Equation 5.4 shows the co-integrating equation, which shows that foreign portfolio investment has a long-run negative effect on the real effective exchange rate. The equation above shows that, in the long-run, foreign portfolio investment is negatively correlated to the exchange rate. This means that when the foreign portfolio investment falls by 1% then the real effective exchange rate increases fall by approximately -0.000101%. The existence of the 1 co-integrating equation means that the Vector Error Correction (VECM) can be estimated to capture the speed of adjustment to long-run equilibrium, which is the next test to be conducted for the real effective exchange rate and foreign direct investment for the duration of this study.

#### 5.2.4.6 Short-run relationship between real effective exchange rate and foreign portfolio investment

**Table 5.39: Short-run VECM results for real effective exchange rate and foreign portfolio investment**

<b>Error Correction:</b>	<b>D(EXCHANGE_RAT)</b>	<b>D(PORTFOLIO_INVEST)</b>
CointEq1	-0.09664	231406
	-0.13351	-75200.3
	[-0.72381]	[ 3.07719]
D(EXCHANGE_RATE(-1))	0.2388	-229878.1
	-0.20382	-114800
	[ 1.17161]	[-2.00242]
D(EXCHANGE_RATE(-2))	-0.196844	-65749.94
	-0.21425	-120676

	[-0.91874]	[-0.54485]
D(EXCHANGE_RATE(- 3))	0.280723	-87585.11
	-0.18205	-102538
	[ 1.54200]	[-0.85417]
D(EXCHANGE_RATE(- 4))	-0.163629	-117773
	-0.17825	-100397
	[-0.91797]	[-1.17307]
D(PORTFOLIO_INVEST( -1))	-7.64E-08	0.450808
	-4.60E-07	-0.25686
	[-0.16750]	[ 1.75507]
D(PORTFOLIO_INVEST( -2))	4.80E-08	-0.105273
	-4.20E-07	-0.23404
	[ 0.11560]	[-0.44981]
D(PORTFOLIO_INVEST( -3))	-5.17E-07	-0.622953
	-4.00E-07	-0.22705
	[-1.28274]	[-2.74370]

D(PORTFOLIO_INVEST(		
-4))	1.14E-06	0.313415
	-4.10E-07	-0.23259
	[ 2.77162]	[ 1.34753]
C	-0.013765	39676.43
	-0.02644	-14890.8
	[-0.52066]	[ 2.66449]
R-squared	0.404326	0.820234

T-values in []

Source: Own estimates based on data from SARB

Table 5.39 above illustrates the results of the short-run Vector Error Correction Model (VECM) conducted for the study period for the real effective exchange rate and foreign portfolio investment. The table shows that there exists one co-integrating equation, which was also found by the Johansen co-integration test that was conducted in Table 5.37 above. The table shows that when the exchange rate is the dependent variable, then 1 co-integrating equation exists. The value of the error correction coefficient of 0.097 means that approximately 9.7% of deviation from equilibrium is eliminated in every month of the year. It takes the model approximately 10.31 years to adjust to the full equilibrium, suggesting that there is slow adjustment to the equilibrium.

The exchange rate lags are not significant (t-values < 1.96), meaning that the previous changes in the exchange rate have no effect on the current changes in the exchange rate. The lags of the foreign portfolio investment are also not significant (t-values < 1.96), suggesting that previous changes in the foreign portfolio investment have no effect on the current changes in the real effective exchange rate. Thus, it can be concluded that short-run changes in the real effective exchange rate have no effect on the foreign investment, and short-run changes in the foreign portfolio investment have no effect on the real effective exchange rate.

**Table 5.40: Autocorrelation LM test of real effective exchange rate and foreign portfolio investment**

<b>Lags</b>	<b>LM-Stat</b>	<b>Prob.</b>
1	3.500953	0.4777
2	1.28748	0.8635
3	3.896785	0.4202
4	3.036267	0.5518
5	9.385291	0.0522
6	2.072175	0.7225
7	2.014664	0.7331

Source: Own estimates based on data from SARB

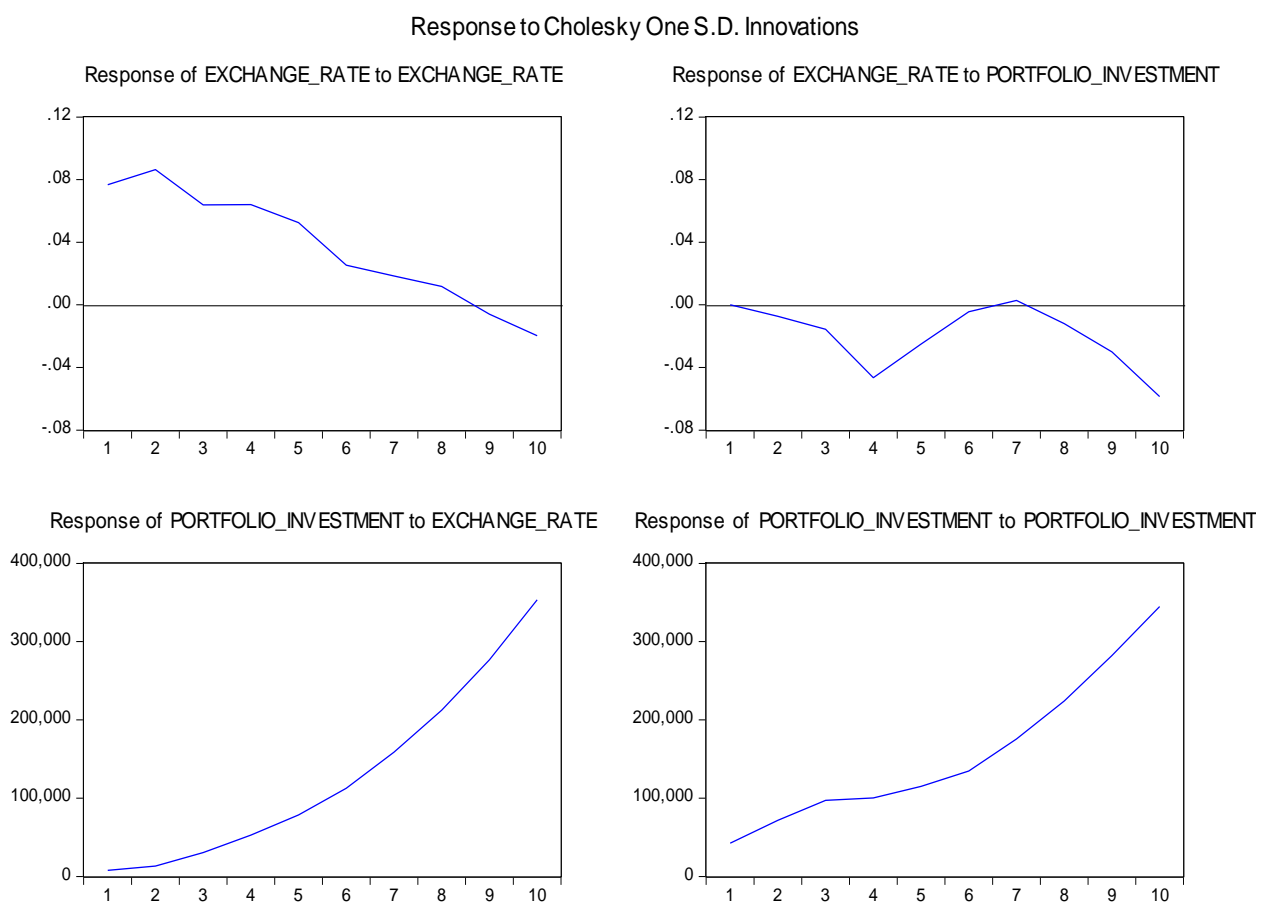
Table 5.40 above illustrates the results obtained from the autocorrelation LM test that was conducted for the real effective exchange rate and foreign portfolio investment for the period of the study, with seven lags being made use of. The table shows that the probabilities of the LM-Stat for all the lags, except the fifth period, are all greater than the 0.05 significance level. This means that the test for autocorrelation for the real effective exchange rate and foreign portfolio investment was successful, thus the goodness-of-fit for the two studied variables was successful.

**Table 5.41: White heteroscedasticity test of real effective exchange rate and foreign portfolio investment**

<b>Chi-sq</b>	<b>df</b>	<b>Prob.</b>
52.99326	54	0.5132

Source: Own estimates based on data from SARB

Table 5.341 represents the results obtained from the conduct of the white heteroscedasticity with cross terms test for the real effective exchange rate and foreign portfolio investment for the period of the study. The table shows that the probability of Chi-square of 0.513 is greater than 0.05; meaning that, at the 5 percent level of significance, the null hypothesis has no heteroscedasticity present. Therefore, there is no heteroscedasticity in VECM model used for analysis of the link between real effective exchange rate and foreign direct investment variables. Thus, the impulse response analysis and variance decomposition tests results have been conducted to determine whether the findings from the VECM meet all econometric assumptions.



**Figure 5.12: Impulse response analysis of real effective exchange rate and foreign portfolio investment**

Source: Own estimates based on data from SARB

Figure 5.12 represents the graphical representation of the impulse response analysis for the real effective exchange rate and foreign portfolio investment for the period of the study. From the figure, it can be seen that when there are changes in the real effective exchange rate then the real effective exchange rate responds in a falling manner, as shown in the top, left graph.

The graph shows that in the 2<sup>nd</sup> period, the effect of shocks in the real effective exchange rate had a high, positive effect on the real effective exchange rate; however, this was met by a sharp fall during the 3<sup>rd</sup> period onwards. This means that the changes in the real effective exchange rate have a negative effect on the real effective exchange rate over time. The top, right graph shows that when there are shocks in the foreign portfolio investment then the real effective exchange rate tends to have a fluctuating impact, moving up and down but always below the positive line. During the 1<sup>st</sup> period, the effect of shocks in the foreign portfolio investment on the real effective exchange rate began the falling pattern, while a sharp fall being experienced during the 4<sup>th</sup> period of the study. However, there was an upward trend during the middle of the 4<sup>th</sup> period throughout the beginning of the 7<sup>th</sup> period. This was, however, met by a fall in the middle of the 7<sup>th</sup> period of the study.

The bottom, left graph shows that when there are shocks in the real effective exchange rate, foreign portfolio investment tends to increase over time. The bottom, right graph shows that when there are changes in the foreign portfolio investment, then the effect on the foreign portfolio investment is positive and increasing, over time.

The results obtained from Figure 5.12 show that the response of the real effective exchange rate to changes in both the real effective exchange rate and foreign portfolio investment is more negative, but the response of the foreign portfolio investment to changes in both the real effective exchange rate and foreign portfolio investment is positive and increasing over time, suggesting that there is a long-run relationship between the real effective exchange rate and foreign portfolio investment.

**Table 5.42: Variance decomposition of real effective exchange rate**

Period	S.E.	EXCHANGE_RATE	PORTFOLIO_INVESTMENT
1	0.076826	100	0
2	0.115857	99.59233	0.407674
3	0.133228	98.31919	1.680811
4	0.154975	89.71391	10.28609
5	0.165516	88.68598	11.31402
6	0.1675	88.88062	11.11938
7	0.168539	88.99079	11.00921
8	0.16938	88.59468	11.40532
9	0.172139	85.89493	14.10507
10	0.182878	77.26701	22.73299

Source: Own estimates based on data from SARB

Table 5.42 illustrates the results of the variance decomposition for the real effective exchange rate for the period of the study. The table shows that without the contribution of the real effective exchange rate, the contribution of foreign portfolio investment starts off at 0% in the 1<sup>st</sup> period then begins to increase in the 2<sup>nd</sup> period to 0.40%. This increasing trend continues on until the 10<sup>th</sup> period reaching a maximum value of 22.73%. The findings from the table suggest that the foreign portfolio investment does not seem to contribute significantly to the real effective exchange rate in the short-run, but the significance of the contribution of the foreign portfolio investment to the real effective exchange rate increases over time. Thus, suggesting that the foreign portfolio investment has a long-run effect on the real effective exchange rate.

**Table 5.43: Variance decomposition of foreign portfolio investment**

Period	S.E.	EXCHANGE_RATE	PORTFOLIO_INVESTMENT
1	43270.95	3.185022	96.81498
2	84763.15	3.226345	96.77365
3	132419.8	6.64185	93.35815
4	174269.2	12.99329	87.00671
5	223194.7	20.33629	79.66371
6	283991	28.33324	71.66676
7	369759.4	35.17374	64.82626
8	481772.7	40.18084	59.81916
9	623162.4	43.73585	56.26415
10	795064.6	46.63174	53.36826

Source: Own estimates based on data from SARB

Table 5.43 illustrates the results of the variance decomposition of the foreign portfolio investment for the period of the study. The table shows that without the contribution of foreign portfolio investment, the contribution of the real effective exchange rate to the foreign portfolio investment is of an increasing effect, reaching a maximum of 46.63% in the 10<sup>th</sup> period. This means that the contribution of the real effective exchange rate to the foreign portfolio investment increases over time, thus showing that there exists a long-run relationship between the two variables.

The results obtained from Tables 5.42 and 5.43 have shown that the contribution of both the variables increases over time, meaning that there is a more significant impact to both the variables in the long-run, thus there is a long-run relationship or interaction between the real effective exchange rate and foreign portfolio investment. These results are consistent with the results found by the short-run VECM test and the impulse response analysis in Table 5.39 and Figure 5.12 respectively.

**Table 5.44: Granger causality test of real effective exchange rate and foreign portfolio investment**

Null Hypothesis:	F-Statistic	Prob.
$\Delta$ PORTFOLIO_INVESTMENT does not Granger Cause $\Delta$ RER	4.05831	0.0093
$\Delta$ RER does not Granger Cause $\Delta$ PORTFOLIO_INVESTMENT	1.00207	0.4214

Source: Own estimates based on data from SARB

Table 5.44 illustrates the results of the Granger causality test which was conducted for the real effective exchange rate and foreign portfolio investment for the period of the study. The table shows that there is a one-way causal relationship between the real effective exchange rate and foreign portfolio investment. This one-way causal relationship means that the foreign portfolio investment Granger causes the real effective exchange rate but the real effective exchange rate does not Granger causes the foreign portfolio investment.

The results obtained from the Granger causality test are consistent with the results obtained from the impulse response analysis and the variance decomposition analysis, in that the foreign portfolio investment has an effect on the real effective exchange rate over the long-run.

### 5.3 Discussion of results

The third section of this chapter focuses on the discussion of the results that were obtained through the conduct of the empirical tests for the real effective exchange rate and different types of investments in South Africa since 1970. The findings in this study for all the variables showed that unit root tests at level were non-stationary, but once the 1<sup>st</sup> difference was estimated then there was stationary. The VECM results showed that there was 1 co-integrating equation in the analysis of all the variables, with the real effective exchange rate being the dependent variable, as well as the co-integrating coefficient in all of the co-integrating tests conducted.

There existed autocorrelation in all the variables, but there was no sign of heteroscedasticity in neither of the variables. The conduct of the Granger causality yielded different results for

the variables. The Granger causality tests for the relationship between the real effective exchange rate and credit extended to the domestic private sector, and the real effective exchange rate and private domestic investment yielded a two-way causal relationship, while the Granger causality tests for the real effective exchange rate and foreign direct investment, and the real effective exchange rate and foreign portfolio investment both yielded a one-way causal relationship.

The findings from the all the tests conducted for the real effective exchange rate and different types of investments suggested a long-run relationship between the real exchange rate and different types of investments in South Africa during the study period of 1970 to 2014. This negative, long-run is consistent with the findings of Darby *et al* (1999), who found evidence that exchange rate fluctuations tend to have a negative effect on investments in the long-run. This is because when investors are uncertain about the future movement of an exchange rate, then these investors are more likely to move their investments from the country to economies that are perceived to have more stable and healthy investment environments. This long-run relationship between the exchange rate and different types of investments in South Africa proved to be negative in nature, and was mostly linked with the depreciation of the South Africa rand.

During 2002, the rand experienced the lowest point of depreciation in the study period, and foreign investment was affected the most by it, while domestic investment grew slightly during this period. The findings that there was a growth in domestic investment during the worst depreciation period is consistent with the findings of Harchaoui *et al* (2005), Campa & Goldberg (1999) and Gomez (2000), who found that a depreciation of a local currency tends to result in exports being more attractive due to the cheaper prices, thus income increases and eventually leads to an increase in investment spending. Similarly, in 1982 the rand experienced its highest recorded appreciation rate that saw no change in the level of foreign investment inflows into the country. Thus, it seems that the inflow of foreign investment into South Africa is affected by the depreciation of the currency, while the rate of domestic investment into the country does not seem to be affected significantly by a depreciation of the currency.

These findings are in line with the concepts of investments which were discussed earlier in chapter 2. These investment concepts stated that the overall investment decisions of investors are determined by a number of reasons, including the risk-return payoff, the significance of

time, asset allocation and portfolio diversification. This suggests that the behaviour of the exchange rate is an important factor, but it is not the only factor that is considered when investment decisions are being made in a particular country. These findings are also in line with the modern portfolio theory which states that investors that are risk-averse prefer to concentrate their efforts on constructing investment portfolios that can maximise their rates of returns, while accepting a lower level of risk.

In the short-run, it was found that there was a relationship between the exchange rate and different types of investments in South Africa from 1970 to 2014, however, this relationship proved to not be statistically significant enough to cause any big implications for the economy. Thus, suggesting that short-run changes in the exchange rate do not have a significant effect on the current changes in investments, and similarly, short-run changes in investments do not have a significant effect on the current changes in the exchange rate.

#### **5.4 Summary**

This chapter presented the results conducted for analysing the relationship between the exchange rate and different types of investments in South Africa since 1970 – 2014. The chapter began with a brief introduction of the chapter then went on to the analysis between the exchange rate and different types of investments in South Africa.

The analysis firstly began with the interaction between the exchange rate and domestic credit extension to the private sector, for investment purposes, which found that there exists a relationship between the exchange rate and credit extended to the domestic private sector, for investment purposes, however, in the short-run, this relationship is not too significant. This means that there is a weak, negative long-run relationship between the two studied variables. Secondly, the analysis of the exchange rate and private domestic investment was conducted, which found that there was a weak, negative long-run relationship between the exchange rate and private domestic investment. This analysis was followed by the analysis of the interaction between the exchange rate and foreign direct investment, which also found that the relationship between the exchange rate and foreign direct investment was long-run in nature and this long-run relationship, was weak and negative. Lastly, analysis was conducted for the purpose of finding the interaction between the exchange rate and foreign portfolio investment, which found that the relationship between the two variables over the long-run is more significant in the long-run. This associated long-run relationship also proved to be weak

and negative, as with the relationship between the exchange rate and the other types of investments used in this study.

All of these analyses of the exchange rate and different types of investments found that the short-run relationship between the exchange rate and different types of investment is not statistically significant. Co-integration was also present between variables, however, there was no heteroscedasticity associated with any of the analysis between the exchange rate and different types of investments in South Africa from 1970 to 2014.

The third section of this chapter focussed on providing the discussion of the results that were found by the analysis conducted between the exchange rate and the different types of investments in South Africa since 1970. The analysis of the exchange rate and different types of investments found that there is a negative, long-run relationship between the exchange rate and different types of investments in South Africa from 1970 to 2014. This suggests that when there are shocks in one variable then the corresponding variable will be affected negatively in the long-run. Similarly, when the exchange rate depreciates, the different types of investments will not be affected significantly in the short-run, however, the effect will be significant in the long-run.

The main implication that the findings of this study has on the economic outlook of South Africa is not promising any economic growth, from an investment perspective. If there continues to be a negative, long-run relationship between the exchange rate and investments in South Africa, then the Gross Domestic Product (GDP) and the economy of the country will not grow. A lack of the economic growth will only result in the increase in government's foreign borrowing in order to bridge the gap between the financially disadvantaged and the wealthy, thus hindering any chance of creating employment opportunities and alleviating poverty in the country.

Another important implication that comes that was given way by the findings of this study is the status of the investment environment of South Africa. If a negative, long-run relationship between the exchange rate and investments continues, then the investment environment of South Africa will be considered as unhealthy and undesirable by both domestic and foreign investors. This will lead to a fall in foreign and domestic investment, as the study has also shown that the investment decisions of investors also relies on the perceptions that investors have of the country to potentially be invested in.

## **CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 Introduction**

South Africa is a country that has gone through a myriad of changes throughout the years, including going through a period of discrimination and social and political unrests, which has contributed to the performance and behaviour of investment prospects, both domestically and internationally. Investment forms an important part in the economic growth and development of any country, more especially in countries in which racial discrepancies have resulted in an ever-growing gap between the rich and the poor. The performance and behaviour of investments are determined by a number of factors, which includes the performance of a country's exchange rate in the global economy. South Africa has experienced periods of different exchange rate regimes which have brought about fluctuations in investments throughout the years.

The contribution that the performance of a country's exchange rate in the broader global economy makes in the attainment of foreign and domestic investment is the basis point of this study. The primary objective of this study was to determine the possible relationship that may exist between the real effective exchange rate and different types of investments within the South African economy from 1970 to 2014. This objective was in line with the empirical objectives of determining the trends of exchange rate fluctuations and the growth of investments in the country from 1970 to 2014. These objectives were the fundamental points which would lead to the conclusions of whether a relationship exists between the exchange rate and different types of investments in South Africa. More specifically, the study investigated the interactions between the real exchange rate and domestic investments which include the credit extended to the domestic private sector and gross domestic fixed investment and the interaction between real exchange rate and foreign investments, which include foreign direct investment and foreign portfolio investment.

### **6.2 Summary of the study**

This study covered the covered different aspect related to link between exchange rate and investments. The section begins with the summary of the literature and empirical review provided in chapter two. The second sub-section of this chapter focuses on the results that were found by making use of the Vector Autoregressive model that was made use of in

chapter four, as well as the findings of the empirical analysis conducted for the real effective exchange rate and different types of investments in South Africa.

### **6.2.1 Summary of the literature**

In order for this study to achieve its main objective, it was essential that both empirical and theoretical literature were included, as well as the variables suggested by these literatures.

A review of previous empirical and theoretical literature has shown that real exchange rates are an important factor to consider when trying explaining trends in different types of investments. The theoretical literature of investments taken into account in this study included the portfolio theory, the life cycle of investment and the accelerator model of investment. All these theories are different; however, they are based on the basic assumption that investment is an important factor that contributes to the economic growth and development of a country and it affected by the exchange rate fluctuations.

The theoretical literature that was taken into account with regards to exchange rates were the purchasing power parity theory; the interest rate parity theory; the portfolio balance approach; the monetary approach theory, as well as the Balassa-Samuelson model. These theories were chosen because of the basic explanations that they provide with regards to exchange rates. These theories have played an important part in the determination of the movements of exchange rates, and have been used extensively over the years.

The conceptualisation of investments found that the risk-return payoff, the significance of time, asset allocation and the diversification of investment portfolios play a significant role in the success of investment. The modern portfolio investment theory found that investors with high risk tolerance tend to receive high rates of returns, while risk adverse investors tend to construct investment portfolios in a way that maximises their rates of return with a lower level of risk. The life cycle of investment theory found that each investor goes through numerous stages, also known as the life cycle stages of investment, in order to accumulate wealth over a period of time. These stages are dependent on the investors' availability to financial resources, enabling investment to take place. The accelerator model of investment found that investment in a country is consistent with the country's ability to produce a certain level of output over a given period of time.

The conceptualisation of exchange rates focussed on the definitions and types of exchange rates, while also focussing on the explanations of exchange rates. The explanations of exchange rate began with the purchasing power parity, which was based on the assumption that the same products should be sold at the same price after two different currencies have been converted into a single, common currency. This theory is divided into sub-sections, namely the absolute purchasing parity, which is only applicable in the long-run, and the relative purchasing parity which states that the exchange rate differences between two currencies needs to be equal to the inflation differences between these two currencies over a period of time.

The interest rate parity theory found that there was a relationship between the spot exchange rate of a country and the future rate of currencies. This means that the theory believes that when fixed investments are made by an investor in two different currencies then the expected rate of return forms both investments should be equal, regardless of differences in the interest rates of the two invested countries. This theory is divided into the covered interest rate parity and the uncovered interest rate parity. These two sub-sections of the theory differ in terms of interest rates being equalised in asset denominated in differing currencies. The covered interest rate parity states that interest rate equalised in asset denominated in different currencies should be equal to zero, while the uncovered interest rate parity requires the equalisation of asset denominated in different currencies should be equal to one.

The portfolio balance approach to exchange rates found that the exchange rate is not only determined by the market forces of supply and demand, but also by the supply and demand of a country's financial assets, while the monetary approach to exchange rates found that the exchange rate is determined by the supply and demand of money between two countries. The Balassa-Samuelson model of exchange rates found that the purchasing power parity theory of exchange rates was flawed in its assumption that two identical products can be priced at the same price in two different countries after the convergence of the two currencies into a common currency. Thus, the Balassa-Samuelson model of exchange rates states that different technological advances in the two countries make it impossible to the prices to be the same.

The empirical literature that has been reviewed in the study showed that fluctuations in real exchange rates have both a direct and indirect effect on investments in both developed and developing nations, and these findings have also shown that investment behaviour is heavily dependent on investors' perceptions and return expectations.

Overall, the reviews of both the theoretical and empirical literature were that the performance of an exchange rate, especially one that is of a free-floating manner, cannot be established as it is determined by the supply and demand of the global economy. Thus, the perceptions that investors have of the exchange rate and investment environment of a particular country is the main determinant of whether an investment is to be made or not.

### **6.2.2 Summary of the empirical findings**

The choice of these variables used was based on the availability of data from the South African Reserve Bank (SARB). The variables used included the real effective exchange rate of South Africa and different types of investments. The Vector Autoregressive model (VAR) was the econometric model which was selected for this study. Several econometric analyses were conducted to determine the interaction between the real effective exchange rate and different types of investments in South Africa. These analyses found that there exists a positive relationship between the real effective exchange rate and different types of investments in South Africa.

In the case of the interaction between the exchange rate and domestic credit extension to the private sector, it was found that in the long-run, the domestic credit extension to the private sector, for investment purposes, has a long-run effect on the exchange rate. In the short-run, however, the appreciation in the exchange rate of South Africa was directly linked to the growth in the different types of investments. The analysis of the interaction between the exchange rate and private domestic investment found that both of the variables have an effect on each other in the long-run. This relationship was proven to be negative, meaning that an increase in one variable will lead to a fall in the other variable over time.

The analysis of the relationship between the exchange rate and foreign direct investment found that the exchange rate was more sensitive to changes in the foreign direct investment variable. Foreign direct investment also affects the exchange rate in the short-run, but the exchange is able to adjust so as to eliminate any deviations from the equilibrium. These results were found to be true in all the analyses between the exchange rate and the different types of investments in South Africa. The long-run relationship between the exchange rate and foreign direct investment was found to be negative. While the analysis of the interaction between the exchange rate and foreign portfolio found that there exists a negative relationship

between the two variables, and that each variable causes changes in the other variable's performance in the long-run.

Overall, the findings from this study have illustrated that there was a negative, long-run relationship present between the exchange rate and different types of investment in South Africa from 1970 to 2014, and that growth in foreign and domestic investments in South Africa is highly dependent.

### **6.3 Conclusions**

The conclusion that this study came to was that movements in the exchange rate play an important part in the behaviour of foreign and domestic investors making investments in the South African economy. The use of a free-floating exchange rate in South Africa has resulted in the rand being exposed to any shocks in the global economy. The conceptualisation of investments that were focussed on in chapter two found that there are other factors that also contribute to the inflow of investments into South Africa.

Finally, this study has shown that the real effective exchange rate and the different types of investments in South Africa are linked together. This means that movements in these variables have an effect on each other, which is the reason why the changes in these variables need to be analysed more in the future. If the South African economy is to improve, and if the goal of the government is to ensure exchange rate stability and increasing investment prospects into the country, then the exchange rate needs to be carefully analysed in order to ensure that it does not depreciate or appreciate to a point where it becomes a hindrance to investments both domestically and internationally.

### **6.4 Recommendations**

The results that were obtained in this study have a number of implications. Based on the findings of this study, three policy recommendations were identified. These recommendations include: the maintenance of the free-floating exchange rate regime, the promotion of a favourable and healthy investment environment, and the alignment of fiscal and monetary policy.

- **Maintain the free floating exchange rate regime**

Fluctuations in real exchange rates have both a direct and an indirect effect on investment. When a domestic currency appreciates, investment tends to decrease due to the increase in the domestic currency, whereas when a domestic currency depreciates then investment prospects into a country increase. Thus, for the South African economy to increase its investment prospects, the depreciation of the currency will work, but only in the short-run. Depreciation of the South African currency will, however, have a negative effect in the long-run, as investments will reduce, thereby reducing economic growth and development.

Therefore, it would be recommended to let the forces of supply and demand to determine the exchange rate, where the exchange rate will eventually go back to equilibrium. This will enable the country to benefit from any favourable movements of the exchange rate, essentially attracting more foreign investment into the country.

- **Promoting a favourable and healthy environment for investment**

The literature suggests that the depreciation of a currency will lead to an increase in exports, and thus investment prospects being pumped into the economy will also increase. However, this increase in investment may be directed to the export-orientated sectors of the economy, and not in the whole economy. It is, therefore, recommended that fiscal and monetary policy authorities should work together when implementing policies in order for these policies to be aligned with each other, and not be in conflict with each other, to achieve more and better investment from both domestic and international investors, which will lead to economic growth and development.

The management of a healthy and stable exchange rate should be a top priority in the country, not only to attract investments from abroad but also to encourage saving and investment by local residents. The management of interest rates, primarily maintaining low rates of interest will stimulate individual consumption, thus leading to the stimulation of a healthy investment environment. South Africa has a problem of a lack of local investment by residents, thus there needs to be an investment environment in the country which emphasises and motivates domestic investment, across all sectors and industries in the economy. This can be obtained by offering favourable interest rates to domestic investors, and also by integrating tax-free investment accounts for a certain level of saving and investing.

It is also important for the policymakers of South Africa to be actively involved in the management of a stable and healthy exchange rate environment by encouraging domestic

investment and savings amongst the youth of the country, as the youth of South Africa constitute the largest population. This step will help in increasing the level of domestic savings and investing made by residents of the country, thus leading to the reduction of external government borrowing, and thereby resulting in higher level of economic growth and development. Higher economic growth and development will stabilise the South African exchange rate, thus resulting in a change in the negative perceptions that investors may have regarding the investment environment in South Africa.

- **Alignment of fiscal and monetary policies**

Fiscal policy can be defined as the deliberate actions of government, through tax income and expenditure, to influence macroeconomic conditions within a particular economy, which can be done through the influencing economic growth, the employment capabilities of a country, the reduction of poverty, as well as encouraging economic stability. Since the results of the study showed that in the long-run high and frequent fluctuations in the exchange rate will have a negative effect on investments, which is an important contributor to the Gross Domestic Product (GDP) within a country, the macroeconomic decisions made by government and fiscal policymakers will be altered negatively. A decrease in domestic and foreign investment means that the financial resources available to a country also decrease, which in many developing countries, such as South Africa, will have a negative effect on the balances of the current and the financial accounts of the balance of payments, meaning that policymakers will have to dip into the country's foreign reserves, or even borrow from abroad in order to pay for imports, thus leading to a bigger budget deficit problems in the country.

It is, therefore, imperative that fiscal and monetary authorities and policymakers make both expansionary and contractionary decisions that are aligned with each other, so that such decisions do not hinder the achievement of set objectives, especially in a country like South Africa, whose exchange rate is determined by the competitive supply and demand macroeconomic factors which the country has no control over whatsoever.

## **6.5 Limitations and areas for further research**

The main limitation faced during the conduct of this study was the use of a basket of major currencies instead of making use of a singular currency in the analysis. Further research can be conducted in determining the relationship between a bilateral exchange rate and different

types of investments in South Africa, to determine the relationship as well as to find arbitrage opportunities that may exist for the economy of South Africa from this analysis.

The rand adopted the free-floating exchange rate which has led to the volatility and misalignment of the economy. Misalignment refers to the appreciation and depreciation of a country's currency. This means that the exchange rate can appreciate or depreciate at any given point during the course of the financial period, which may contribute to the behaviour of the inflow of domestic and foreign investment in the country. Thus, further research can be done to test whether the analysis of the relationship between exchange rates and different types of investments in South Africa would lead to different conclusions.

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