AN ANALYSIS OF THE IMPACT OF THE EXCHANGE RATE ON UNEMPLOYMENT IN SOUTH AFRICA

by

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Submitted in fulfilment of the requirements for the degree

M.Com in Economics

in the

SCHOOL OF ECONOMIC SCIENCES

in the

FACULTY OF ECONOMIC SCIENCES AND INFORMATION TECHNOLOGY

at the

VAAL TRIANGLE CAMPUS OF THE NORTH WEST UNIVERSITY

Date of submission:

2014-11-07

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This is to confirm that I, the undersigned, have assisted with the statistical analysis and interpretation for the Master of Commerce thesis entitled: *an analysis of the impact of the exchange rate on unemployment in South Africa by Sonika van Dyk.*

Regards,

Jacolize Meiring

IV. ACKNOWLEDGEMENTS

In the completion of this study a word of thanks is given to the following persons:

- To my Heavenly Father, Jesus Christ, for granting me the strength to continue through all the hardships by giving me a sound mind and hope when I thought all was lost.
- To my parents, Sylvia and Sybrand van Dyk, for granting me the opportunity to further my studies. Without their continued support, guidance and motivation none of this would have been possible.
- To my husband, Francois van Niekerk, for your love, encouragement, understanding and support though it all.
- To my friend and mentor, Jacolize Meiring, for all your mentorship, assistance, inspiration and guidance with the statistical aspects and processes involved in this study.
- To my family and friends for their support and prayers.
- To my supervisor, Dr Diana Viljoen, for her advice and efforts in ensuring the completion of this study.
- To the editor, Melissa Labuschagne, for all your hard work and reassurance.

“I can do all things through Christ who strengthens me” Philippians 4:13

V. ABSTRACT

AN ANALYSIS OF THE IMPACT OF THE EXCHANGE RATE ON UNEMPLOYMENT IN SOUTH AFRICA

KEY WORDS: Real exchange rate, Unemployment rate, Inflation, Economic growth, Imports, Exports, VAR, VECM, Macroeconomic transmission channel.

A volatile real exchange rate and high unemployment rate is a growing concern in South Africa, therefore the right macroeconomic policy is required. The challenge is to find stability in the real exchange rate paired with a low inflation rate, both of which are necessary to promote long term economic growth, which in turn creates more job opportunities. This study analyses the impact of the exchange rate on unemployment in South Africa by considering quarterly data for the period 2003 to 2013.

In this study, the macroeconomic transmission channel is divided into two transmission paths, imports and exports. These find their roots in the Phillips curve and the Keynesian theory on unemployment respectively. The vector error correction model (VECM), together with an analysis of the impulse response functions and variance decompositions, are implemented to determine the short and long run impacts of the exchange rate on unemployment. After the completion of a variety of specifications, estimations and tests, both macroeconomic transmission paths revealed in the empirical analysis that the real exchange rate has a significant impact on unemployment. In the imports transmission path, the real exchange rate, imports and the CPI have significant long term relationships with unemployment. Furthermore, the exports transmission path found significant short term relations with unemployment in considering the real exchange rate, exports and economic growth. The impulse responses in both transmission paths indicated that a shock in the exchange rate will have a significant effect on unemployment in the short run. Similar results were found with the variance decomposition. In the import transmission path, movements in the real exchange rate explained an increasing portion of the variance in unemployment. Alternatively, in the export transmission path the real exchange rate and exports explained an increasing portion of the variance. The evidence therefore suggests that South Africa should focus more on stabilising the exchange rate, since fluctuations in unemployment are a result of shocks in the real exchange rate, following the macroeconomic transmission channels discussed.

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LIST OF ABBREVIATIONS

AD ..... Aggregate Demand

ADF ..... Augmented Dickey-Fuller test

ACF ……..Auto Correlation Function

AIC ..... Akaike Information Criterion

AS .....Aggregate Supply

ASGI-SA ..... Accelerated Shared Growth Incentive for South Africa

BJ .....Bera-Jarque test

BOP ..... Balance of Payments

BOPM .....Merchandise Imports

BOPX .....Merchandise Exports

BRER .....Bilateral Real Exchange Rate

CLRM ..... Classical Linear Regression Model

CPIX .....Consumer Price Index

CPI ..... Consumer Price Inflation

DF .....Dickey-Fuller test

DL ..... Demand for Labour

EAP .....Economically Active Population

FDI .....Foreign Direct Investments

FPE .....Final Prediction Error

FPL ..... Food Poverty Line

GDP .....Gross Domestic Products

GLS .....General Least Squares

GNI .....Gross National Income

GNP ..... Gross National Product

HQ .....Hannan-Quinn Information Criterion

IES ..... Income and Expenditure Survey

IPAP ..... Industrial Policy Action Plan

LBOPM .....Log Merchandise Imports

LBOPX .....Log Merchandise Exports

LBPL ..... Lower-Bound Poverty Line

LCPI .....Log Consumer Price Index

LFS .....Labour Force Survey

LGDP .....Log Gross Domestic Product

LR .....Likelihood Ratio

LRER .....Log Real Effective Exchange Rate

LUEM ..... Log Unemployment rate

MPC .....Monetary Policy Committee

MRER ..... Multilateral Real Exchange Rate

NDP .....National Development Plan

NER .....Nominal Exchange Rate

NPC .....National Planning Commission

OLS .....Ordinary Least Squares

PPP ..... Purchasing Power Parity

QES ..... Quarterly Employment Statistics

QLFS ..... Quarterly Labour Force Survey

R .....Rand

RER ..... Real Exchange Rate

SA .....South Africa

SARB ..... South African Reserve Bank

SC ..... Schwarz Information Criterion

SL ..... Supply for Labour

STATS SA ..... Statistics South Africa

UBPL ..... Upper-Bound Poverty Line

UEM ..... Unemployment rate

US .....United States

US$ ..... United States Dollar

USCTAD ..... United Nations Conference on Trade and Development

VAR ..... Vector Autoregression

VECM .....Vector Error Correction Model

WEF ..... World Economic Forum

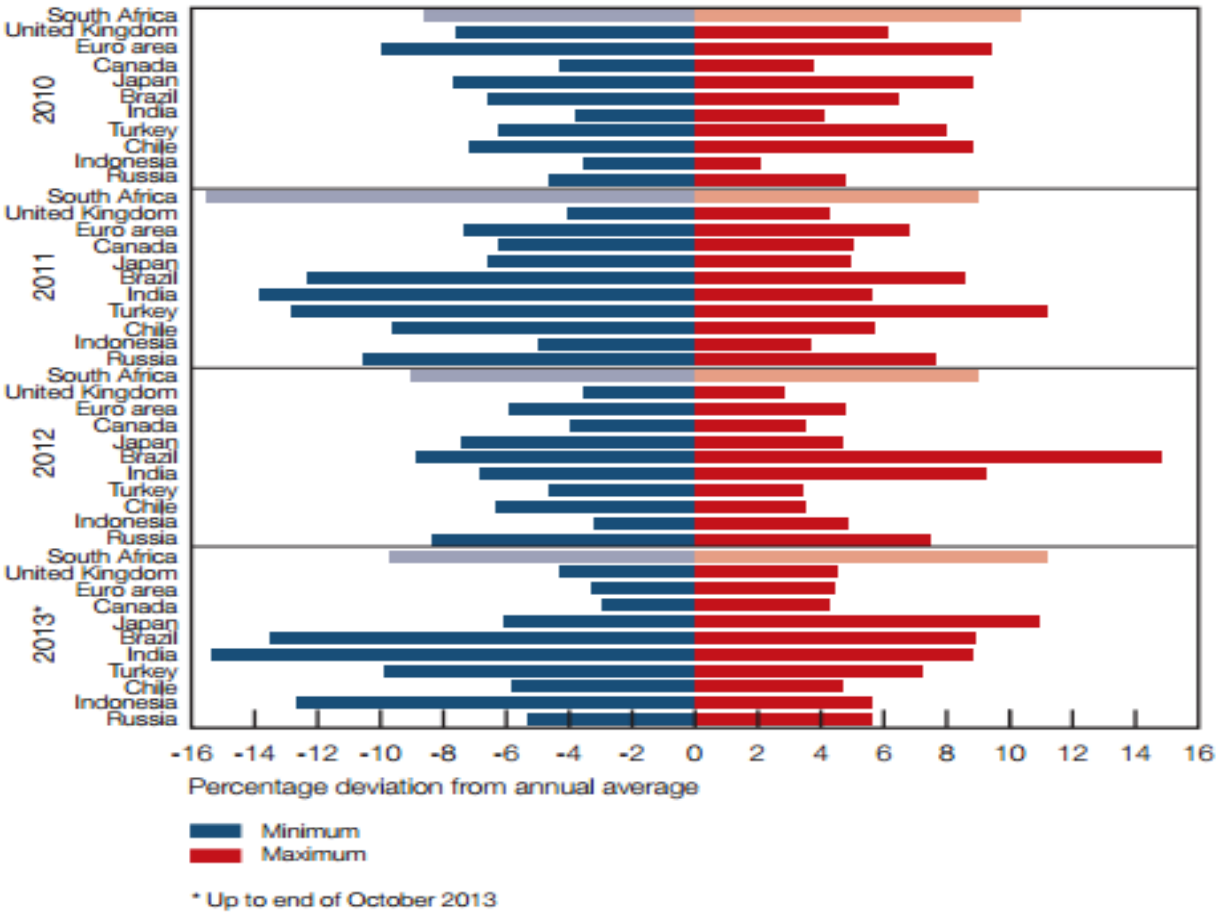
WLS ..... Weighted Least Squares

CHAPTER 1: INTRODUCTION, PROBLEM STATEMENT AND RESEARCH OBJECTIVES

1.1 INTRODUCTION

South Africa (SA) has a floating exchange rate system, which means that it is driven by demand and supply in the foreign exchange market. This contributes to the volatility of the rand, which affects the demand for money (Frankel, 2008:1; Muller-Plantenberg, 2010:46). The exchange rate is considered to be the most important instrument in lowering inflation and enhancing economic growth (Tarawalie, 2010:8).

Figure 1.1: Currency volatility against the US dollar



Source: SARB Quarterly Bulletin (2013).

In Figure 1.1, it can be seen that the rand remained the most volatile currency over the three year period, therefore it is necessary to stabilise the currency to more acceptable

levels. Due to the highly volatile rand, diminutive attention is given to the analysis of the exchange rate and unemployment in economic development. Research shows that there is a concentration on the short-run macroeconomic problems, with long-term objectives being stability in the external and financial sector, regardless of growth and employment (Ngandu, 2008:205). However, it was found that in order to create an environment conducive to employment creation, a competitive real exchange rate (RER) is necessary for development (Rodrik, 2007:2).

There are several transmission channels through which the exchange rate can influence the economy of which two broad groups can be distinguished: the macroeconomic channel and the industry channel (Ngandu, 2008:205). However, this study will only focus on the macroeconomic channel, which is based in the Keynesian aggregate demand theory and the Phillips curve. The Keynesian theory suggests that a depreciated currency is necessary to enhance competitiveness thereby boosting domestic income and output, and hence net exports. The depreciation will reduce the demand for imports, thereby improving the balance of payments. Through the multiplier effect, an increase in exports is projected to increase the aggregate demand, and eventually domestic production and employment (Ngandu, 2008:206). Alternatively, the Phillips curve suggests that a depreciation in the currency surges the price of imports. This surge leads to an increase in cost push inflation, thereby increasing the inflation rate as well as the rate of unemployment (Mohr *et al*.,2008:504).

According to Tarawalie (2010:8-9), the exchange rate is seen as a macroeconomic instrument, which can be used to ensure lower inflation rates and to stabilise the financial system, thereby enhancing real economic growth. Nevertheless, this theory neglects the impact of inflation which may grind down the domestic countries' competitiveness, and hence exports. As stated by María-Dolores (2009:1); Verdelhan (2010:124) and Dornbusch *et al.* (2009:137), a positive relationship exists between the exchange rate and inflation. A decrease in the inflation rate will lead to depreciation in the exchange rate, in turn increasing domestic production and output, hence also increasing economic growth. The inflation rate movements could then cause external and internal shocks in the economy that may influence real economic growth (Betts & Devereux, 1996:1007-1021).

As a result, a country can minimize the risk of inflation stemming from a change in exchange rates with the implementation of macroeconomic policies (Ngandu, 2008:206).

Inflation targeting was adopted by the South African Reserve Bank (SARB) in 2000, and although it may be deemed effective in achieving price stability, it can damage economic growth, and thereby employment opportunities (Cordero, 2008:145; van der Merwe, 2004:5). According to Epstein (2009:1), price stability is the primary role of monetary policy, although global unemployment, underemployment and poverty are critical world issues which take centre stage (SARB, 2010:1).

The South African Reserve Bank (SARB) held the view that low inflation (brought about by a reduction in consumer spending) and exchange rate stability (brought about by enhanced foreign investment) would do more to encourage long term economic growth and employment creation (ITRISA, 2010:227). In the budget speech of 2010, finance Minister Pravin Gordhan (2010:12) stated that "…*we will continue to take steps to counter the volatility of the exchange rate and to lean against the wind during periods of rapid capital inflows*…"

The aim of this study is to analyse key macroeconomic variables such as the current account in the balance of payments (focusing on the effect of imports and exports); the inflation rate, which includes demand pull and cost push factors; and the gross domestic product (GDP). This analysis will be carried out to determine which of these secondary variables have the greatest possible significance to the stated impact of the exchange rate on the unemployment rate in South Africa (SA).

Economic growth plays an important role in reducing the unemployment rate as a result of demand-pull inflation. This inflation was due to an increase in the demand for exports, which was encouraged by a depreciation in the local currency. On the one hand, a depreciated currency would be beneficial to some extent, but on the other hand it increases the relative prices of imports. SA is highly reliant on imported manufactured and intermediate goods used in the production process, which increases the cost of production (also called cost-push inflation). A depreciation in the currency may contribute to cost-push inflation since this increases the cost of importing raw materials and labour. This increase in cost in turn increases the cost of production. However, a depreciated currency also

improves international competitiveness due to a relative reduction in the price of exports, thereby increasing aggregate demand.

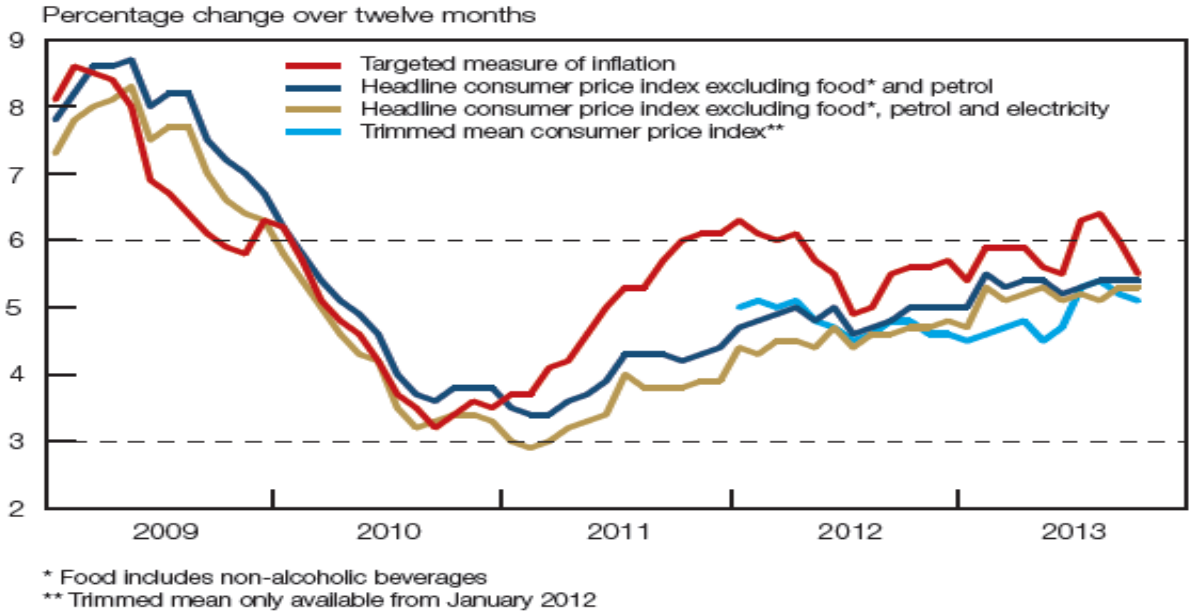
According to the President of the South African Reserve Bank, Gill Marcus (2010:10), all the local factors that lead to an increase in the inflation rate may also cause the exchange rate to depreciate, therefore, local macroeconomic stability is also of vital importance. The ability to maintain macroeconomic stability will enhance the implementation of development policies usually aimed at creating more job opportunities, thus promoting the general well-being of a population.

1.2 PROBLEM STATEMENT

Although the global economic activity improved in the third quarter of 2013, the recovery still remains fragile and uneven while most economies rely on macroeconomic policies to support their economic activity. From March 2012 to September 2013 the real effective exchange rate (RER) weakened by 15.2%, improving South African exporters' international competitiveness (SARB, 2013:46). Although the rand depreciated, which should have improved the current account through an improvement in exports, the deficit in the balance of payment's current account widened from 5.9 as a percentage of GDP in the second quarter of 2013 to 6.8% in the third.

The export markets are restrained not only by a deterioration in the terms of trade, but also domestic supply side constraints such as the recent prolonged labour strike actions. Strong merchandise imports into SA and a weak exchange rate contributed to cost-push inflation, causing consumer price inflation (CPI) to exceed the upper 6% target, which was mainly due to higher fuel and food prices during 2013 (SARB, 2013:21). Figure 1.2 illustrates the underlying measures of consumer price inflation generally fluctuating in a fairly narrow range throughout 2013, appearing reasonably contained.

Figure 1.2: Underlying measures of consumer price inflation



Source: SARB Quarterly bulletin (2013).

Economic growth deteriorated to 0.7% in the third quarter from an increase of 3.2% in the second quarter of 2013. This is mainly as a result of supply constraints, as well as subdued real production (SARB, 2013:1-4). A reduction in economic growth does not only lower domestic production, but also hinders employment creation. Statistics South Africa's (Stats SA) quarterly employment statistics (QES, 2013:3) indicate that in the third quarter of 2013, employment increased by 0.2% on a quarter on quarter and annualised basis. This led to an increase of 8 453 jobs in the formal non-agricultural sector.

Unemployment is a growing concern in SA. During the 2007/2008 recession, 1.1 million jobs were lost; therefore SA requires long term solutions to reduce the unemployment rate, which could be achieved with the right macroeconomic policy (Laubscher, 2010:1). To enable SA to fight an increase in the unemployment rate, policies should be implemented to increase production levels in order to increase economic growth. The challenge is to find a balance that will achieve real economic growth (production growth after inflation) to lower the unemployment rate in SA. In other words, the SA economy should not become overheated through accelerated inflation or a steep depreciation in the value of the rand. Exchange rate stability with a low inflation rate is required to encourage long term economic growth, thereby creating more job opportunities (ITRISA, 2010:103).

1.3 RESEARCH OBJECTIVES

The following objectives have been formulated for the study:

1.3.1 Primary objectives

The primary objective is to determine if there is any significant relationship between the exchange rate and the unemployment rate in SA.

1.3.2 Theoretical objectives

In order to achieve the primary objective, the following theoretical objectives are formulated for this study:

- Examine the basic theory of the major macroeconomic variables used in the macroeconomic transmission channel;
- Explain and analyse the policies and trends of the macroeconomic variables used in the macroeconomic transmission channel in South Africa form 2003 to 2013;
- Theoretically explain the methods in which the data was captured and sampled;
- Theoretically explain the vector autoregressive model, the vector error correction and the cointegration theory; and
- Examine the theoretical modelling framework.

1.3.3 Empirical objectives

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

- Explain the model specification in the two transmission paths known as the transmission path imports and the transmission path exports;
- Determine stationarity of all variables included in the macroeconomic transmission;
- Determine the correlation matrix in the transmission path imports and the transmission path exports;
- Estimate the optimal lag length for both the transmission path imports and the transmission path exports;
- Test for cointegration between variables included in both the transmission path imports and the transmission path exports;

- Estimate the vector error correction model in both the transmission path imports and the transmission path exports;
- Test for autocorrelation, normality and heteroscedasticity in both the transmission path imports and exports, respectively as part of the residual diagnostic tests; and
- Estimate the impulse response function and variance decomposition in both the transmission path imports and exports as part of forecasting.

1.4 HYPOTHESIS

A hypothesis is a statement used to test if there is a relationship between variables (Hair *et al*., 2008:56). According to Berndt and Petzer (2011:30-31), there are two types of hypothesis, namely a null hypothesis (H0) that states that there is a relationship difference, and an alternate hypothesis (H1) stating that there is no relationship between variables. The statistical testing of the hypotheses will indicate the following:

- The null hypotheses: there is a relationship between the exchange rate and the unemployment rate in SA; and
- The alternate hypothesis: there is no relationship between the exchange rate and the unemployment rate in SA.

1.5 RESEARCH DESIGN AND METHODOLOGY

The study will comprise a literature review and an empirical study. Quantitative research will be used for the empirical portion of the study.

1.5.1 Literature review

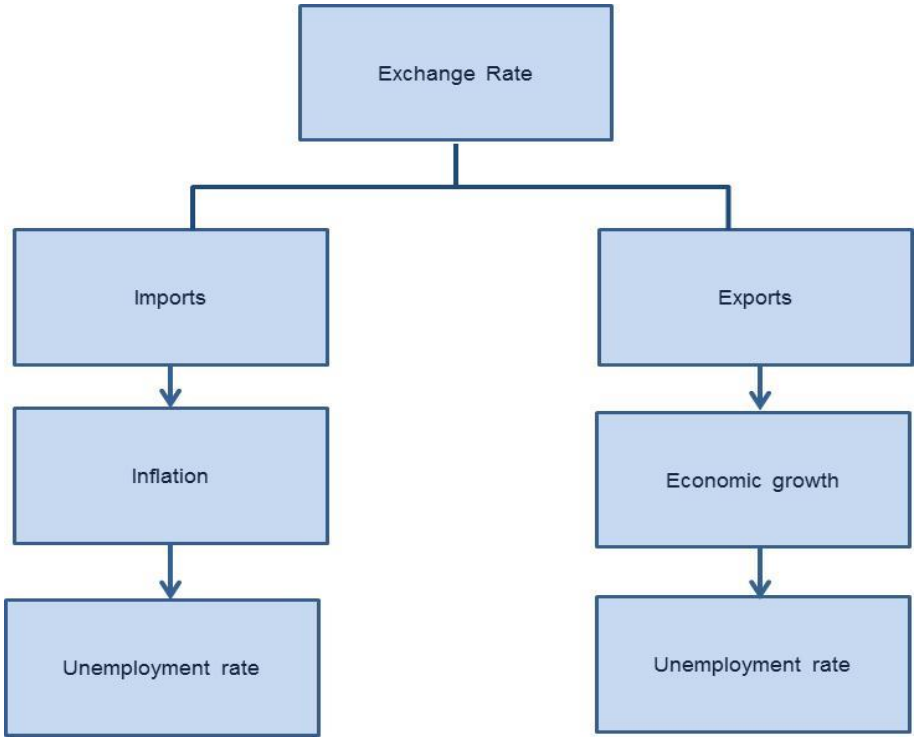
This research will be conducted utilising textbooks, journals, newspapers and the internet to collect sources, not only to provide a theoretical framework, but also to support the empirical study.

1.5.2 Empirical study

An empirical analysis of quarterly observations from 2003 to 2013 will be conducted; secondary data will be obtained from the South African Reserve Bank (SARB) and Statistics South Africa (Stats SA). An analysis of specific variables used in the study will be explained further in Chapter 4.

Since the data collected will be of a time series nature, it is appropriate to adopt time series models followed in similar studies, such as the vector autoregression (VAR) model by Berument *et al*. (2006:2). The computer package EVIEWS 7 will be used as a tool to aid in the estimation of the adopted model.

Figure 1.3: The macroeconomic transmission channel



Source: van Dyk (2014).

As illustrated in Figure 1.3, the macroeconomic transmission channel between exchange rates and unemployment provides for two equation analyses in the VAR model. One of these equations will consider imports and the other exports in order to determine the effect of the exchange rate on unemployment in SA. This will be explained further in Chapter 4.

1.6 CHAPTER CLASSIFICATIONS

Chapter 1 (*Introduction, problem statement and research objectives*) provided a brief introduction about the importance of fighting unemployment. The linkage and impact of the exchange rate on the unemployment rate were also explained. The problem statement, objectives and a description of the research methodology were also discussed.

Chapter 2 (*Theoretical constructs of the Macroeconomic channel*) presents the literature review, which consists of theoretically discussions of each of the variables in the macroeconomic channel. These variables include the exchange rate, exports, imports, inflation, economic growth and the unemployment rate.

Chapter 3 *(The Macroeconomic channel in South Africa)* provides an analysis and discussion on each of the variables used in the macroeconomic channel, specifically focussing and discussing the trends seen in each of these variables in SA for the period 2003 to 2013.

Chapter 4 (*Research Methodology*) will explain the data and methodology used in this study. This includes a description of the inquiry strategy and broad research design, the method in collecting the data, and the assessment and demonstration of the quality and rigour of the proposed research design. The theory regarding the vector autoregression model, as well as the vector error correction and cointegration theory will also be explained.

Chapter 5 (*The analysis and interpretation of research findings*) provides the results following an econometric analysis to determine the possible significant relationship between the exchange rate and the unemployment rate. Different combinations of variables are tested for significant coefficients.

Chapter 6 (*Summary, conclusion and recommendations*) provides a summary of the study, including the conclusions drawn from the study and possible recommendations.

CHAPTER 2: THEORETICAL CONSTRUCT OF THE MACROECONOMIC CHANNEL

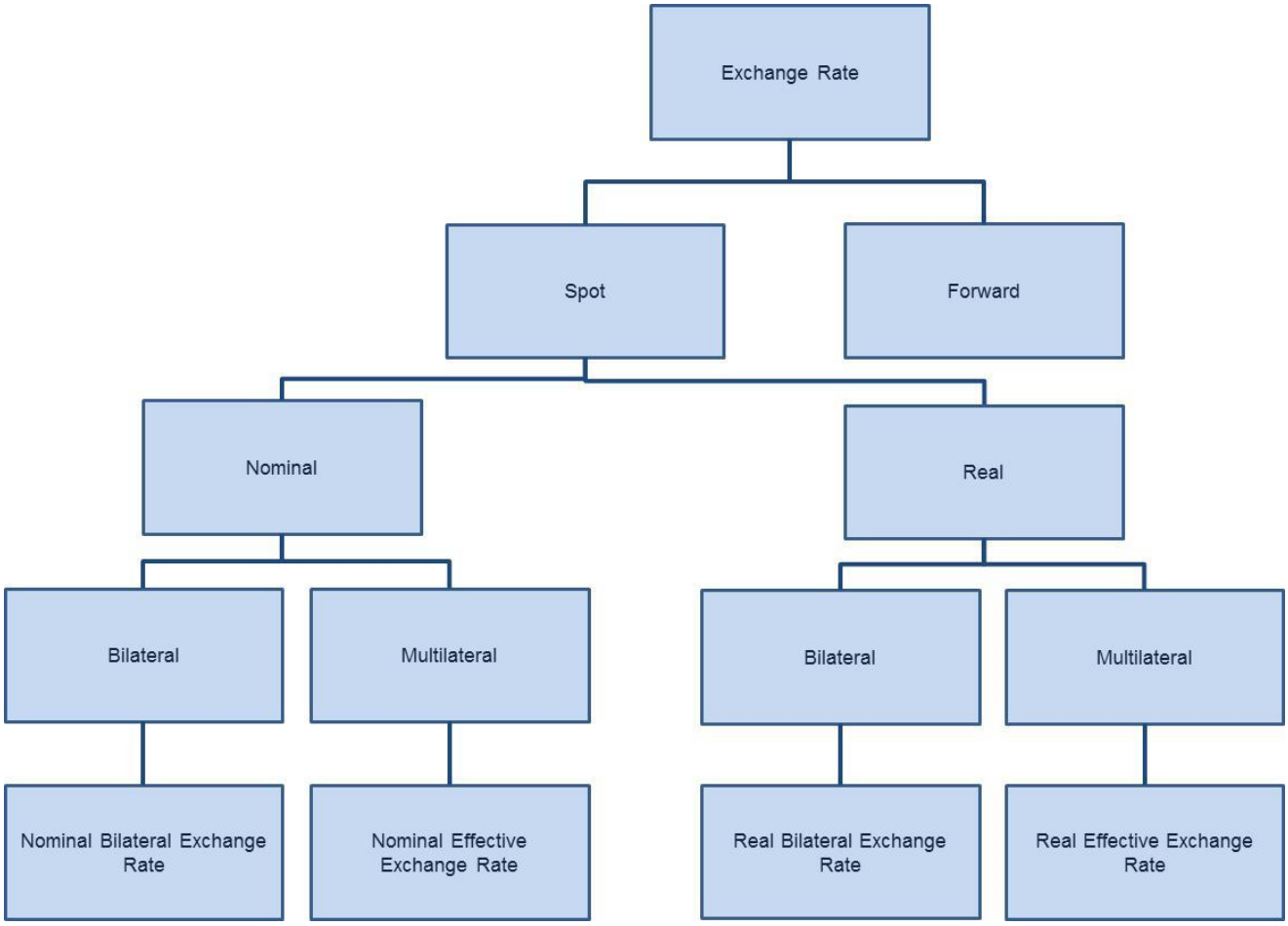
2.1 INTRODUCTION

The exchange rate is considered to be the most important instrument in lowering inflation and enhancing economic growth (Tarawalie, 2010:8). It is quite complex to determine the direct relationship between the exchange rate and the unemployment rate. In order to attempt to explain this possible relationship, this study will therefore employ possible transmission paths that include other key macroeconomic variables. These macroeconomic variables include the current account in the balance of payments (BOP) focusing on the effect of imports and exports; the inflation rate, which includes demand pull and cost push factors; and the GDP. By considering these secondary variables, conclusions can also be drawn regarding the impact of each of these variables on the unemployment rate. Each of the variables involved in the transmission paths will be discussed in the following chapter.

2.2 EXCHANGE RATES

According to Dornbusch *et al.* (2009:46) and Frankel (2008:1), the exchange rate can be seen as the price for a foreign currency, which is influenced by the demand for money. Other economists define the exchange rate as, "*the relative price of the domestic and foreign currency*" (Wachtel, 1989:265). Thus it is said to be, for example, the amount of foreign currency per dollar. In Figure 2.1, the conceptual composition of the exchange rate will be explained, as well as the sub categories of the two major types of exchange rates.

Figure 2.1: Conceptual composition of the exchange rate



Source: Takaendesa (2006).

According to Mohr (2005:147) and Takaendesa (2006:4-10), there are two major types of exchange rates.

- The spot exchange rate: this is the rate at which foreign exchange is bought and sold for immediate delivery. The spot exchange rate can be further divided into nominal and real terms:
  - Nominal Exchange Rate (NER): This is the price of one national currency relative to another, which allows importers and exporters to compare prices directly; and
  - Real Exchange Rate (RER): This is the nominal exchange rate adjusted for inflation discrepancies.

  Since trade also takes place between domestic countries, as well as other major trading partners, two categories of both the NER and the RER can be identified:

  - The bilateral real exchange rate (BRER): this is applied where the computation of the real exchange rate involves only two currencies; and
  - The multilateral real exchange rate (MRER): this is applied where the computation of the real exchange rate involves more than one country, usually those of its major trading partners. Thus, the overall measure of the movement of the rand against major currencies is obtained by calculating the effective (multilateral) exchange rate.
- The forward exchange rate: the rate used for the exchange of bank deposits at some specified future date.

The forward price is determined by the spot rate and the interest rate differential between the two countries, and can be higher (at a premium to) or lower (at a discount to) than the spot price (Mohr, 2005:147-148). Therefore, forward exchange transactions provide importers and exporters an opportunity to cover themselves against the risk of future changes in the spot exchange rate. The following section provides an overview of exchange rate regimes found in the world, as well as the functioning of a foreign exchange market.

2.2.1 Exchange rate systems

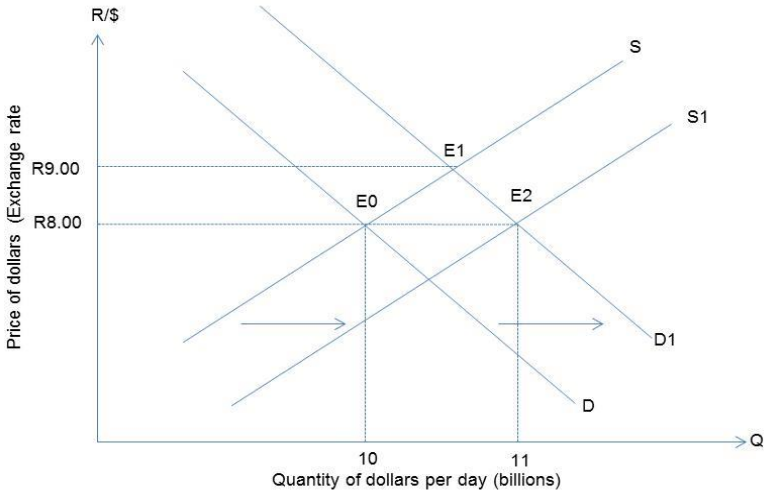
2.2.1.1 Floating exchange rate regime

A floating (flexible) exchange rate regime exists when the price of the currency is determined by the market forces of supply and demand in the foreign market (Dornbusch *et al*., 2009:46; Farlex Financial Dictionary, 2009:1). The change in the price of foreign exchange is referred to as a currency appreciation or depreciation. In the case of depreciation, the domestic currency becomes less expensive in terms of foreign currencies or, in other words, less foreign currency is required per unit of domestic currency. The advantage of this system is that the deficit or surplus in the BOP will be automatically corrected, although the trading and investment environment are filled with uncertainty (ITRISA, 2010:111). According to Dornbusch *et al.* (2009:285), two types of floating exchange rate systems exist:

- Clean floating, which is caused by no central bank intervention and leaves the BOP at zero. This will result in neither a surplus nor deficit in the BOP; and

- Dirty (managed) floating, which is caused by central bank intervention in the foreign exchange market in an attempt to control the exchange rate. This is explained in Figure 2.2.

Figure 2.2: Managed floating



Source: Mohr *et al*. (2008).

Figure 2.2 illustrates how developments in the foreign exchange market are monitored by the central bank, who then decides how to intervene. As the demand for imports increases, due to an increase in South African imports, the demand curve will move from D to $D1$. The movement in the demand curve will result in an excess demand for dollars (the difference between $E0$ and $E2$). If central banks do not intervene in the foreign exchange market, the price of dollars will increase to $1.00 =R9.00, at $E1$. Thus the rand will depreciated against the US dollar. In order to avoid such depreciation in the rand, SARB could supply $1 billion into the market, moving the supply curve from S to $S1$. Thus a new equilibrium is reached at $E2$ where the exchange rate remains $1.00 = R8.00 (Dornbusch *et al.*, 2009:285; Mohr et al., 2008:393-395).

2.2.1.2 Fixed exchange rate regime

A fixed exchange rate regime occurs when the government intervenes by linking the domestic currency to a foreign currency in order to keep the currency (prices) fixed (Farlex Financial Dictionary, 2009:1). To fix the currency of a country, the government intervenes by buying and selling foreign exchange reserves (ITRISA, 2010:112). This increases the

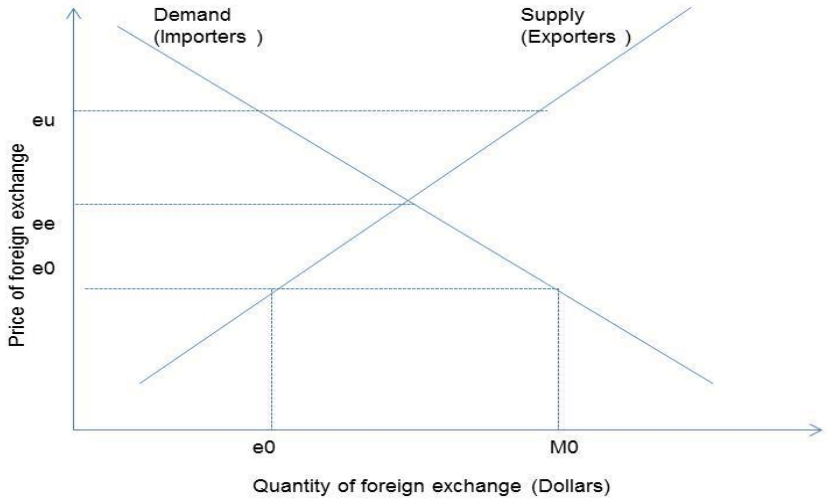
money supply, which increases inflation if there are no clear (sterilized) operations. Sterilisation operations occur when the central bank leaves the money stock unchanged when responding to an increase in reserves. The central bank does this by selling bonds in the open market or by increasing the reserve requirements of commercial banks (Frankel, 2008:1). This means that the government is an active trader in the foreign exchange market.

The change in prices of the foreign exchange is referred to as a currency revaluation or devaluation. When the price of a foreign currency is increased by official action, devaluation in the domestic currency takes place, which makes the domestic currency cheaper for foreign buyers (Dornbusch *et al*., 2009:287).

2.2.2 The foreign exchange market

There are many theories explaining why currencies fluctuate and what determines the rates between theses currencies. Figure 2.2 indicates the supply and demand curves of a country's currency, which will be discussed to explain what factors cause a currency to appreciate or depreciate.

Figure 2.3: Appreciated and depreciated exchange rates



Source: Perkins *et al*. (2006).

When the government decides to follow a fixed exchange rate regime, it intervenes, which can have two possible outcomes according to Perkins *et al.* (2006:724-725); Tarawalie (2010:9) and Anastopoulos (2011:3):

- An overvalued exchange rate (currency appreciation) occurs when the exchange rate is below the equilibrium at ($e0$), which creates an excess supply; and
- An undervalued exchange rate (currency depreciation) where the exchange rate is above the equilibrium at (eu), which creates an excess demand.

According to Perkins *et al.* (2006:724), the exchange rate is one of the most powerful instruments which directly affect the domestic prices of everything traded. Its uniform effect influences the prices of all tradable goods, where the exchange rate adjusts the prices between tradable and nontradable goods.

The effect of demand and supply on a currency and how it creates either an appreciation or depreciation in the value of dollars or rands can be explained by the following example. When US Dollar (US$) is exchanged for rand (R), the demand for the rand increases making it more expensive, thus an appreciation in the rand value. If R is exchanged for US$, the supply of rands in the market increases, which leads to a decrease in demand for R, thus the rand depreciates (Anastopoulos, 2011:3). According to Mohr and Fourie (2008:391), the demand for US$ in South Africa come from sources such as:

- SA importers (pay for imported goods and services in US$);
- SA residents purchasing US assets;
- American investors purchasing SA assets; and
- SA tourists.

Various sources exist for the supply of dollars in South Africa according to Mohr and Fourie (2008:391):

- SA exporters (prices quoted in $, then exchanged for R);
- Foreign holders who purchase SA assets; and
- Foreign tourists.

The same sources that increase the demand and supply for US$ will therefore also contribute to the demand and supply of the R. An equilibrium exchange rate will occur where the quantity of the rands demanded is equal to the quantity of the rands supplied. This is the equilibrium point under a floating exchange rate regime indicated in Figure 2.3

at (ee). According to Anastopoulos (2011:3), any disequilibrium will be eliminated by the market itself. In the next section, the balance of payments (BOP) will be explained.

2.3 THE BALANCE OF PAYMENTS

"*The balance of payments (BOP) is a record of all the transactions between a country's residents and the rest of the world*" (Dornbusch *et al.,* 2009:281; Wachtel, 1989:268). According to Mohr *et al.* (2009:69), the BOP is a summary of all the transactions made by foreign as well as domestic households, firms and governments during a certain period.

2.3.1 The basic accounts in the balance of payments

The BOP consists of four basic accounts, namely: the current account; the financial (capital) account; and gold and other foreign reserves. Each of these accounts will be explained briefly as according to Mohr *et al*. (2009:384-388) and Dornbusch *et al.* (2009:281).

2.3.1.1 The current account

The current account records the difference between exports and imports within a certain period, it is also referred to as the trade balance. If the value of exports exceeds that of imports, it is referred to as a surplus in the trade balance, however, if the value of imports exceeds that of exports, there is a deficit in the trade balance.

2.3.1.2 The financial account

The financial account records assets and liabilities in international transactions. There are three main components in the financial account:

- Direct investments includes all the transactions wherein the investor can gain control in the management of the business in which the investment was made;
- Portfolio investments includes the purchases made by the investor where its only interest is the expected financial return on investment assets such as bonds and shares; and
- Other investments include all other financial transactions such as loans, currency and deposits.

2.3.1.3 Gold and other foreign reserves

Through capital inflows and capital outflows a country can earn and pay in foreign currency by means of exports and imports. If a country receives more foreign currency than its payments, the country's foreign reserves increase. However, when payments are higher than the receipts, foreign reserves decrease. The importance of gold and foreign reserves means that:

- The overall BOP position is reflected;
- Foreign reserves ensure a smooth flow of international trade and finance;
- Large fluctuations in the exchange rate can be prevented; and
- They are an indicator of the authority's scope to stimulate the economy.

2.3.2 The relation between the exchange rate and the current account

The relationship between the exchange rate and the balance of payments can be determined through the elasticity of demand for the imports and exports channels to determine the extent to which the price changes affect the volume of goods traded (Anastopoulos, 2011:5; Carbaugh, 2008:451). The Marshall-Lerner condition illustrates the effect that a currency depreciation has on the domestic country's trade balance. A short description of each of these factors follows.

2.3.2.1 Elasticity of demand

The elasticity approach can be used to assess the impact of currency depreciation on the current account by considering the price sensitivity of imports and exports. According to Carbaugh (2008:449), the elasticity of demand can be seen as the responsiveness of buyers to changes in prices. In other words, the elasticity of demand is determined by how much the quantity demanded and the quantity supplied will change in response to the change in price (Mohr *et al.,* 2009: 154). The elasticity of demand can by symbolised in the following manner:

(2.1) $$Elasticity\ of\ demand = \frac{\Delta Q / Q}{\Delta P / P}$$

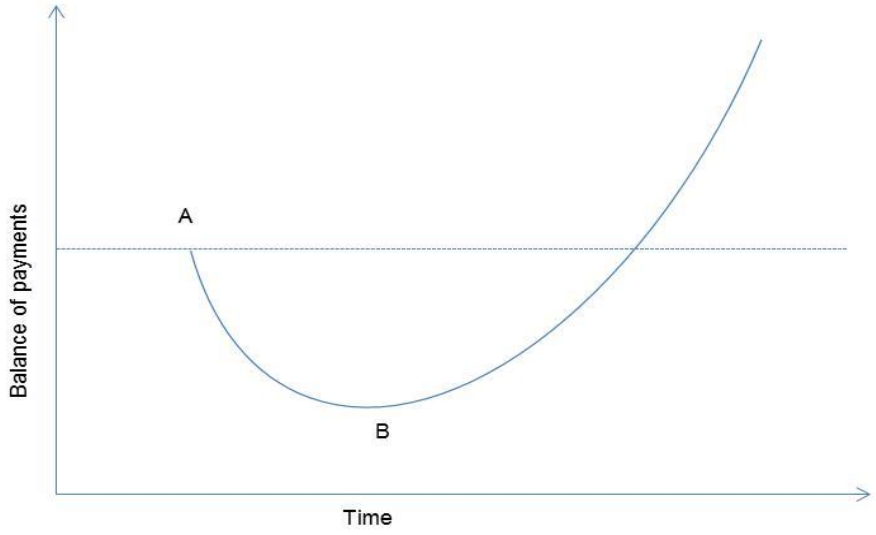
2.3.2.2 The Marshall-Lerner condition

The Marshall-Lerner condition can be used to determine how an increase in the real exchange rate will improve the current account of the BOP (van Marrewijk, 2005:8). If the sum of the price elasticity of demand for imports and exports is greater than one, the current account will improve due to depreciation in the currency (Anastopoulos, 2011:4). The Marshall-Lerner condition can also be used to determine the actual outcome of currency depreciation where this condition states the following (Carbaugh, 2008:449):

- A depreciation will improve the balance of trade if the demand elasticity of imports plus the demand elasticity of exports exceeds 1;
- A depreciation will worsen the trade balance when the sum of the demand elasticity is less than 1; and
- The balance of trade will be neither improved nor worsen when the sum of the demand elasticities is equal to 1.

The J curve effect can be used to demonstrate how a depreciation in the exchange rate can affect the current account balance in the short term, as illustrated by Figure 2.4.

Figure 2.4: The J curve effect



Source: Anastopoulos (2011).

Figure 2.4 illustrates that depreciation in the currency will first worsen the current account balance before it is improved. According to The Economist (2014:1), a depreciated

currency will cause exports to be cheaper and imports to be more expensive, thus leading to a smaller surplus or a bigger deficit in the current account in the BOP. On the one hand, as time passes the export volume will start to increase as foreign buyers purchase goods at lower prices. Domestic consumers, on the other hand, will purchase less expensive imports, which in turn improves the trade balance. This shows that the price elasticity of the demand for imports and exports has an immediate effect on the change of an exchange rate (Anastopoulos, 2011:4).

2.3.3 The effect of the exchange rate on imports and exports

International trade, and conditions affecting the BOP, does have an effect and can constrain the performance of the economic growth of a country. For foreign exchange earnings to exceed foreign exchange spending, a positive balance on the BOP should be maintained. There is a positive relationship between imports and economic growth: as growth increases, so will imports. This might cause the trade balance to decrease, because foreign exchange is needed to finance imports, thus reducing current foreign reserves. Net capital inflows, such as foreign loans or investments, are necessary to prevent foreign exchange losses during economic growth periods. Increases in exports and foreign investments are required to increase foreign exchange earnings, thus leading to increased foreign exchange reserves that improve the trade balance (Dornbusch *et al.*, 2009:284).

As the cost to imports increases due to a depreciated currency, it increases the cost of production and the domestic prices of imported goods and services. The factors of production become more expensive, harming productivity output, which also contributes to a higher unemployment rate due to the lack of economic growth (Mohr *et al.,* 2009: 481).

A depreciated currency, adversely, encourages exports by making the domestic country more competitive internationally, which increases the aggregate demand. An increase in demand will necessitate an increase in production; leading to an improvement in economic growth. This would create more job opportunities, hence decreasing the unemployment rate (Dornbusch *et al.,* 2009:292). In the following section, inflation will be explained as one of the macroeconomic variables.

2.4 INFLATION

Inflation can be defined as a "*continuous and considerable increase in the general price level*" (Mohr *et al.,* 2009:475). According to Dornbusch *et al.* (2009:39), inflation can be seen as "*the rate of change in prices*". The consumer price index (CPI) is the most commonly used indicator in measuring the general price level, which represents the cost of a basket of consumer goods and services.

2.4.1 Causes of inflation

Inflation is a very complex dynamic process which can be ascribed to many causes. Mohr *et al.* (2009:485-486) discuss two approaches that explain the main causes of inflation.

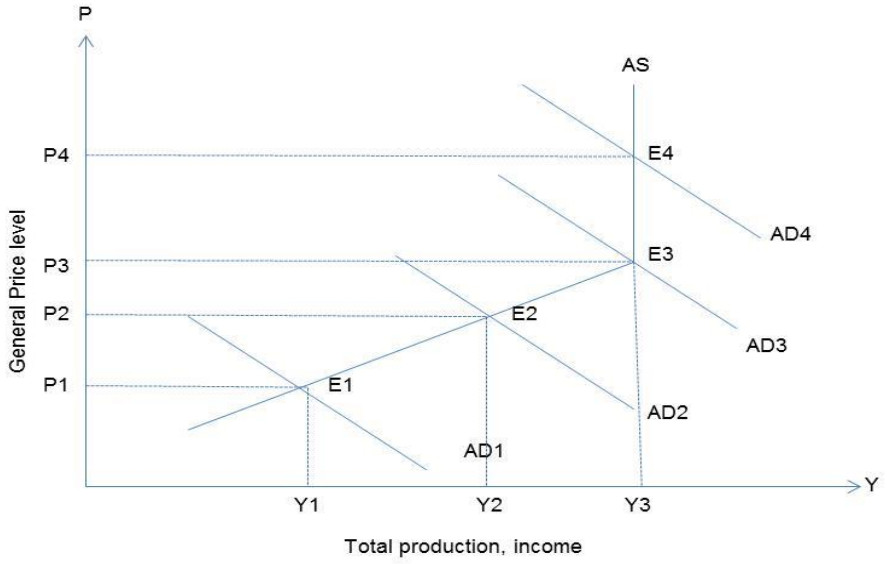
2.4.1.1 Demand pull inflation

Demand-pull inflation is often described as "*too much money chasing too few goods*" as explained by Mohr *et al.* (2009:486). This type of inflation occurs when the aggregate demand for goods and services exceeds the aggregate supply thereof. There are various components of aggregate demand that cause demand-pull inflation, these include:

- Increased consumption spending by households due to the greater availability of cheaper credit;
- Increased investment spending due to lower interest rates and improvements in business expectations;
- Increased government spending as a result of combatting unemployment and better services delivery; and
- Increased export earnings due to an improvement in international economic conditions.

Demand-pull inflation can be explained by using the aggregate demand and supply model (AD-AS model), as illustrated in Figure 2.5.

Figure2.5: Demand-pull inflation



Source: Mohr *et al. (*2009).

Figure 2.5 illustrates the rightward shift or increase in the AD curve following form increases in consumption, government spending, increases in investments or increases in export earnings. This contributes to an increase in the general price level (P), as well as an increase in production and income (Y). Therefore a conclusion can be drawn that demand-pull inflation positively affects production, income and employment. Although when the economy reaches, for example, full employment at $AD3$, a further increase in the aggregate demand to $AD4$ will only lead to an increase in the price level at $E4$.

In order for the authorities to keep demand-pull inflation under control, a restrictive monetary and fiscal policy is required. This is done by increasing interest rates (monetary policy) to reduce the availability of credit, while government spending is reduced or taxes increased (fiscal policy) to reduce aggregate demand. This will lead to a reduction in prices, hence lower inflation; however, this also contributes to a reduction in production, income and employment.

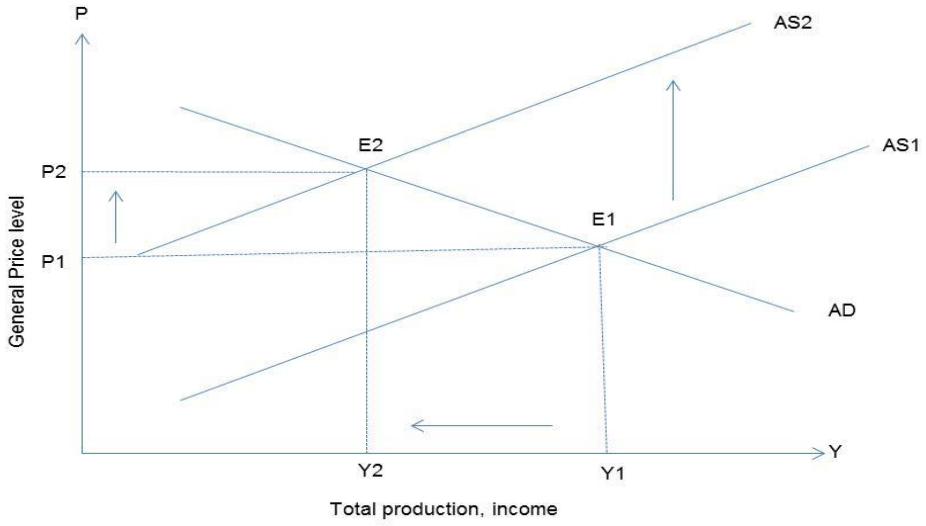
2.4.1.2 Cost push inflation

An increase in the cost of production triggers cost-push inflation, as these costs cause the price level to increase. There are five main causes of cost-push inflation, which include (Mohr *et al.,* 2009:485-486; Odhiambo, 2011:12):

- An increase in wages and salaries, which are the largest cost component that leads to an increase in the cost of production;
- The cost of imported capital and intermediate goods, largely due to a depreciated currency or price increase in the rest of the world. However, these too cause production costs to increase;
- Increases in profit margins, because profits are also included in the factors of production, such as wages. When businesses increase their profit margins, so will they increase the cost of production;
- A decrease in productivity, if the same remuneration is received while producing less, the cost per unit of output increases, making the economy less productive; and
- Natural disasters, specifically in agricultural and related products, because draught and floods may limit supply, which leads to an increase in the cost of production of derivative goods or services.

The AD-AS model can also be used to explain cost-push inflation, which is illustrated and discussed in Figure 2.6.

Figure 2.6: Cost-push inflation



Source: Mohr *et al. (*2009).

In Figure 2.6, the cost-push inflation is illustrated by the $AS1$ curve moving to the left (upwards) to $AS2$ due to, for example, an external shock in the economy through an increase in world oil prices (Odhiambo, 2011:12). Therefore it can be seen that an

increase in cost-push inflation will lead to an increase in the price level form $P1$ to $P2$, while production and income decrease from $Y1$ to $Y2$ Y2. A conclusion can therefore be made that this type of inflation harms production, income and employment, leading to the wage-price spiral (Odhiambo, 2011:12). This phenomenon can be called stagflation, because an increase in inflation is also accompanied with an increase in the unemployment rate. The following measures can be taken to combat cost-push inflation:

- To control wages, salaries and profit margins; and
- To increase productivity.

This can be done by applying an income policy, since a restrictive monetary and fiscal policy can reduce the price level, but will increase the unemployment rate even further.

2.4.2 The effects of inflation

In order to understand how inflation influences society, three effects are considered, which include distribution effects, economic effects, and social and political effects (Mohr *et al.,* 2009:479-482).

2.4.2.1 Distribution effects

The distribution of income and wealth among various participants in the economy is affected by inflation. The redistribution between creditors and debtors is the first important distribution effect, where borrowers (debtors) benefit from inflation at the expense of lenders (creditors). In other words, the real value of money decreases when prices increase.

2.4.2.2 Economic effects

A higher inflation rate mostly contributes to lower economic growth and a higher unemployment rate since the macroeconomic performance is not improved (Ball & Sheridan, 2003:23). This phenomenon occurs due to speculative practices being stimulated, which do not contribute to the country's productive capacity, in order to maintain their living standards during inflation. An increase in inflation reduces traditional contributions such as fixed deposits and pension funds, therefore discouraging savings.

Problems in the BOP are another serious effect of inflation, as previously discussed, as it increases the cost of exports, making a country less competitive internationally.

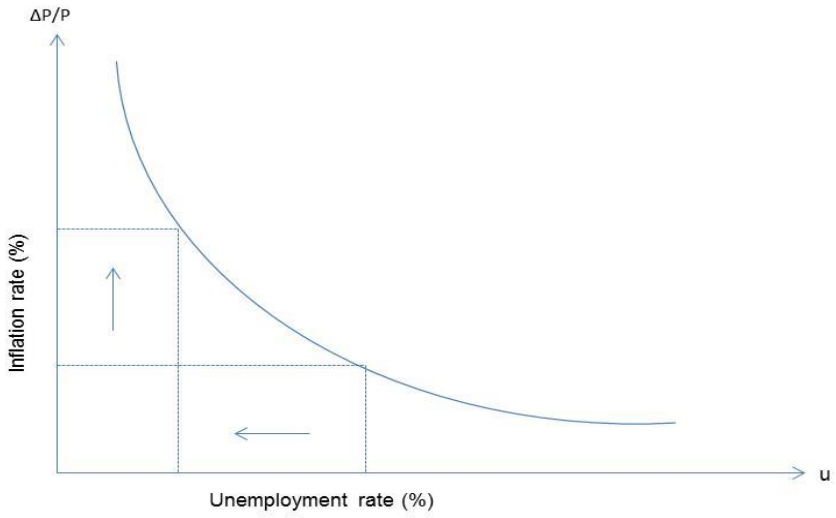
2.4.2.3 Social and political effects

Inflation further undermines economic performance through its social and political consequences, spreading unhappiness amongst different ethical groups due to the increased cost of living (Moolman & Du Toit, 2004:168). These consequences mostly lead to social and political unrest, which disrupt the economic process.

2.4.3 The Phillips curve

The Phillips curve can be used to explain the trade-off between the unemployment rate and inflation. The Philips curve is an inverse relationship between the unemployment rate and the rate at which money wages increase (Dornbusch *et al*., 2009:120).

Figure 2.7: The Phillips curve



Source: Mohr & Fourie (2004).

Figure 2.7 illustrates that when the government attempts to alleviate some socio-economic problems (including unemployment) by following an expansionary fiscal policy, building infrastructure, schools, and roads, more people will be employed, thereby reducing the country's unemployment rate. As more is invested in the economy and more people are employed, this will increase the number of people who are able to spend in the economy. As more people have the power to spend, this may contribute to an increase in the prices

of goods (inflation). This result comes from the fact that more money will be chasing the same amount of goods (Dornbusch *et al*., 2009:121). In this example, the government, in its attempt to reduce unemployment, has caused an increase in inflation. Therefore an increase in the inflation rate may cause the value of the currency to decrease because the supply of money exceeds the demand, which causes a depreciation in the currency. (Huston *et al.,* 2005:133). In the next section, economic growth will be explained.

2.5 ECONOMIC GROWTH

According to Perkins *et al.* (2006:31), economic growth can be seen as the rise in the real national income per capita, which measures the economic capacity of the goods and services produced by an economy. As a result, economic growth can be seen as one of the central requirements in achieving economic development.

2.5.1 Measuring economic growth

The following types of measurements of economic growth exist (Dornbusch *et al*. (2009:36; Perkins *et al.,* 2006:32).

2.5.1.1 Gross national product

The gross national product (GNP) is the "*sum of the value of finished goods and services produced by a society during a given year*" (Perkins *et al*., 2006:31). The GNP is also known as the gross national income (GNI), as referred to by the World Bank and other multilateral institutions. The difference between the GNP and the GDP is that the GNP does not include all the income earned by foreign-owned factors of production in the domestic country, thereby representing the standard of living in the domestic country (Mohr *et al.,* 2009: 62).

2.5.1.2 Gross domestic product

The gross domestic product (GDP) is the sum of the value of all finished goods and services produced by all inhabitants of a country during a given year (Perkins *et al*., 2006:31-33).

To avoid double counting, only final goods and services are included in the calculation of the GDP. Therefore, the GDP is a measure of both total income and output (including total

value added). According to Dornbusch *et al*. (2009:36), GDP does not only measure the total output, but also measures the welfare of the domestic country.

2.5.2 The basic growth model

The basic growth model focuses on the key determinants of the change in output, and consequently economic growth. This can be done by examining the following five equations, as explained by Perkins *et al.* (2006:105-108).

The aggregate production function can be used at a national level where the total amount of output can be described as the relationship between the total labour force and the value of the capital stock of a country. The aggregate production function is calculated with the formula:

(2.2) $Y = F(K, L)$

Therefore, total output is a function of capital stock and labour supply. The level of savings is assumed to be at a fixed share of income and can be expressed by the following equation:

(2.3) $S = s \times Y$

This means that the total value of savings is represented by the average savings rate, which can be maximized as income increases. The saving-investment identity assumes that with only one good and no international trade, the total savings relate to investments, in other words: $S = I$. This means that the total amount of savings is equal to the investments in a closed economy caused by income which is either consumed or saved and therefore output is equal to income.

The capital stock can be determined by two main forces, namely new investments and depreciation. Therefore the changes in the capital stock can be expressed in the following way:

(2.4) $\Delta K = I - (d \times K)$

When there is a depreciation of the existing capital stock, the value of capital stock by means of new investments decreases and vice versa.

The growth rate of the labour force is assumed to grow at the same pace as the total population. The change of the labour force can be represented by the following equation: (2.5) $\Delta L = n \times L$ which indicates that the change in the labour force will be equal to the total population times the labour force.

These five equations are ultimately used to determine economic output through the representation of this complete model. To simplify these five equations, some of the equations are combined, which results in the following equation:

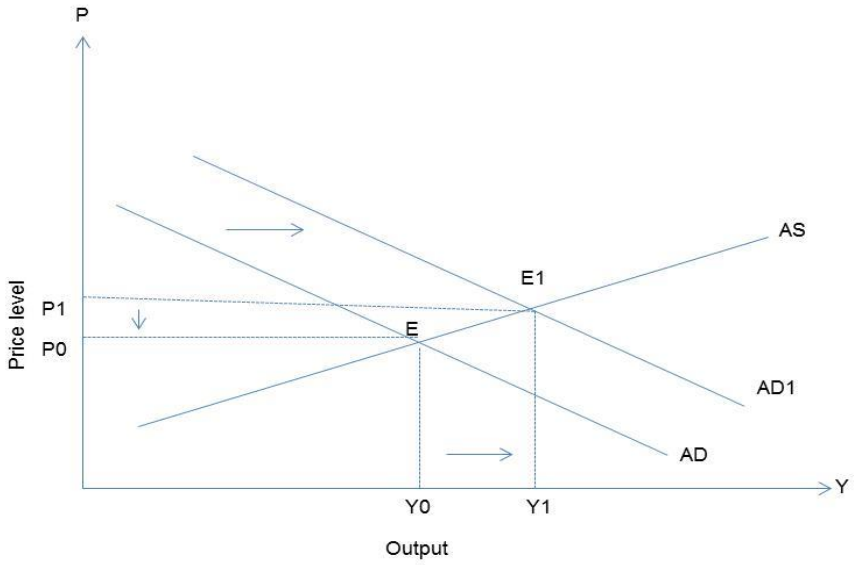
(2.6) $\Delta K = sY - d \times K$

This indicates that the aggregate level of savings determines the level of investment, which can in turn be used to determine the changes in the capital stock.

2.5.3 Short term economic growth

The Keynesian case of short-term economic growth can be explained by using the aggregate demand and aggregate supply curve.

Figure 2.8: Keynesian short-term aggregate demand and aggregate supply



Source: Dornbusch *et al*. (2009).

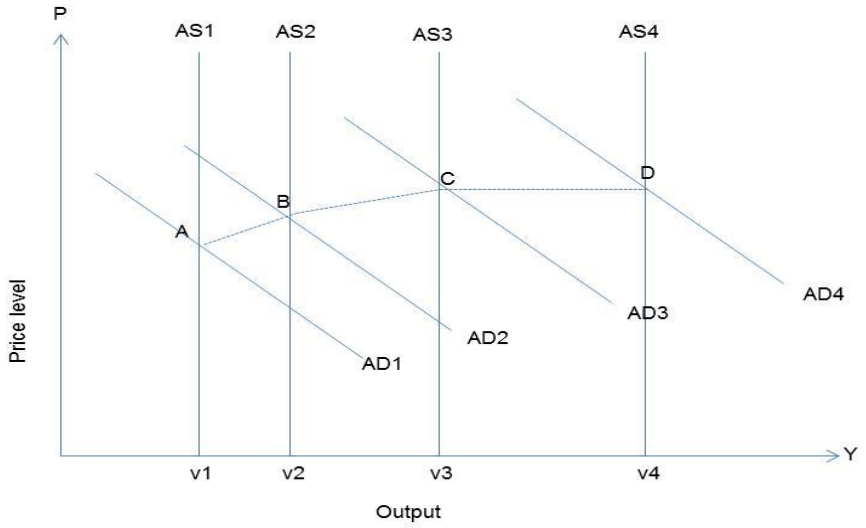
Figure 2.8 illustrates that the AD shifts to $AD1$ due to an increase in the money demand. This resulted from a reduction in the interest rates to encouraging investment and spending, as well as a reduction in the cost of borrowing. In the short run, the aggregate

supply (AS) moves up the curve as prices increase, although firms are reluctant to change prices, the price level is only affected by output in the short term (Dornbusch *et al*., 2009:102-110; Economics Help, 2010:1).

2.5.4 Long term economic growth

Long-term economic growth is explained and illustrated in Figure 2.9 where AS is assumed to be nonelastic.

Figure 2.9: Long run shifts in aggregate demand and aggregate supply



Source: Dornbusch *et al*. (2009).

AD depends on movements in the money supply; but these movements in the long run are very small. This is in contrast with AS movements, which move at a fairly steady rate in the long run. The greater the movement of AS to the right, the more the output (growth), whereas the greater the movement of AD to the right, the prices increase will flatten out. In other words, as the money supply increases, output increases, thus leading to economic growth. Conversely, when the demand for money increases, so does its value, which reduces prices and hence inflationary pressures.

According to Economics Help (2010:1), the long term potential growth can increase for the following reasons:

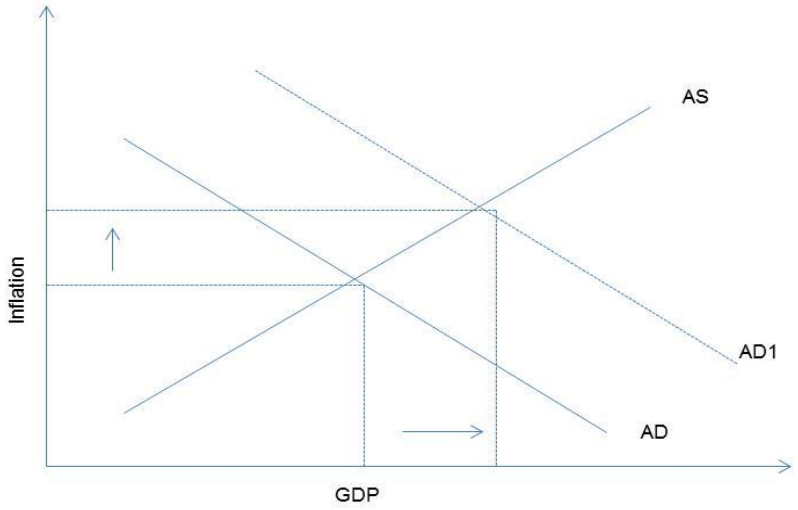
- Capital increase causes growth to increase when investing in infrastructure;
- An increase in employment can lead to productivity in the production process;

- New raw material discoveries can decrease cost and increase productivity and so the balance of trade; and
- Improvements in technology provide more productive ways in using capital and labour.

2.5.5 Inflation and economic growth

According to Casellina and Uberti (2008:1), Taylor's rule can be used in forecasting the inflation rate; therefore its impact on economic growth can be explained by Figure 2.10.

Figure 2.10: The relationship between inflation and growth



Source: Taylor (1995).

Stabilising the inflation around the targeted level and its potential output is the main aim of central banks (Hofmann & Bogdanova, 2012:37). An increase in inflation will lead to an increase in GDP growth moving from AD to $AD1$ because Taylor's rule makes use of a restrictive monetary policy (interest rates are increased). A restrictive monetary policy is introduced due to positive shocks (inflation) on long-term interest rates (Casellina & Uberti: 2008:1). According to Hofmann and Bogdanova (2012:37), the Taylor rule is a useful rule in assessing the performance of the monetary policy by mechanically linking "*the level of the policy rate to deviations of inflation...and of output*". In the following section the unemployment rate will be discussed.

2.6 UNEMPLOYMENT RATE

A person is unemployed when he or she seeks work but cannot find any. Therefore the unemployment rate is "*the total number of the unemployed persons as a percentage of the total number of available workers*" (Mohr, 2000:88).

People become unemployed when the demand for labour (DL) exceeds the supply for labour (SL). People cannot be considered unemployed if they do not comply with the criterion of unemployment, which includes (Cawker & Whiteford, 1993:2):

- A condition (without employment);
- An attitude (employment desire); and
- An activity (employment searching).

This in short means that a person is considered unemployed if he does not have a job, he has the desire to have a job and he is actively seeking a job opportunity. The economically active population (EAP) is an important measure to determine the supply of labour.

According to Doğrul and Soytas (2010:1523), in the demand-supply framework labour productivity, wages, and factors of production price level will affect the level of employment. Macroeconomic factors should also be considered as they affect local factors. These factors include the state of the economy, business cycles, and technology level and population demographics. In order to develop sound macroeconomic policies, policy makers should have a clear understanding of all the factors that affect the unemployment rate in the long run.

2.6.1 Causes of unemployment

In this section the major causes of unemployment will be explained briefly.

2.6.1.1 Factor price distortion

The factor price distortion contributes to the unemployment problem because the absorption of labour is reduced in favour of capital. This makes certain inputs more expensive than others, for example labour, causing an increase in the demand for cheaper inputs (such as capital) in order to save on cost. In SA, capital was made cheaper and

labour expensive, therefore labour was substituted for capital inputs (Cawker & Whiteford, 1993. 32).

2.6.1.2 Demographic transition

Demographic transition refers to the changes in population growth, which moves a country from developing to developed. Because of rapidly growing populations, job opportunities became scarce. This can be seen as the major cause of unemployment in the world. Due to high population rates, the formal sector is unable to find employment for mostly young, unskilled labour. The consequences of high population rates include (Cawker & Whiteford, 1993. 34; Stutz & Warf, 2012:79):

- Poverty;
- Over cultivation and soil depletion;
- Deforestation;
- Malnutrition;
- Depletion of water resources;
- Unsatisfactory social environments; and
- Rural-to-urban migration.

2.6.1.3 State of the economy

During a recession, the growth rates of countries start to decline, causing the unemployment rate to rise sharply (George, 1988:314).

2.6.1.4 Technology

According to George (1988:314), economic depressions and recessions were studied linking long term economic cycles of about thirty years to the development of new technology. The research showed that after the introduction of technical innovations, a major recession or depression followed. Technology can be seen as the main driving force behind the growth phase of each cycle. As the capacity increases due to the availability of new technologies, prices and margins decrease, which discourages further investment.

If at the end of a company's growth phase it creates an overcapacity, they will most likely survive since they have the most efficient technology (Stockhammer & Klär, 2011:437).

Towards the end of the boom if a nation invests heavily in new technology, they will create a successive slump, whereas those nations that invest the least will suffer from it. According to George (1988:315), the following can be concluded, an "*increasing technical efficiency driving the integrated world economy into new investment and new profits, over-investment, over-capacity and falling profits, and hence to financial crisis, capacity shedding and unemployment*".

2.6.1.5 Business cycles and social change

New technology can directly affect the social and institutional framework in the economy, thus creating unemployment. In the business cycle during the growth phase, higher production will be accompanied by higher productivity with stable employment and social structure. However, during the overshooting phase, as capacity increases, the demand for goods and services will decrease, hence employment opportunities will also decrease (George, 1988:315). In other words, technical advances also increase efficiency in the economy; it may also lead to greater social upheavals.

2.6.1.6 High real interest rates and insufficient capital accumulation

High real interest rates and insufficient capital accumulation is seen by the Keynesian view as the main reasons responsible for unemployment. Research done by Stockhammer and Klär (2011:437) found statistically significant negative effects between unemployment, interest rates and capital accumulation. In other words, there is a negative relationship between capital accumulation and the rate of unemployment. This means that a reduction in capital accumulation will lead to an increase in the unemployment rate. If capital accumulation increases by 1%, unemployment is reduced by 0.92% without any time effects. Capital accumulation has a strong impact on unemployment even when interest rates are controlled. According to the Keynesians, insufficient capital formation can cause unemployment, which may follow the following channels (Fitoussi *et al*., 2000:259; Stockhammer & Klär, 2011:443):

- Demand channel: through volatile investments driving the business cycle, as well as the growth theory. Investments can therefore determine the level of output and employment;

- Supply channel: through limited substitutability because unless there is an elasticity of substitution of one, equilibrium unemployment will depend on the capital stock; and changes in the domestic real interest rate changes the average unemployment rate.

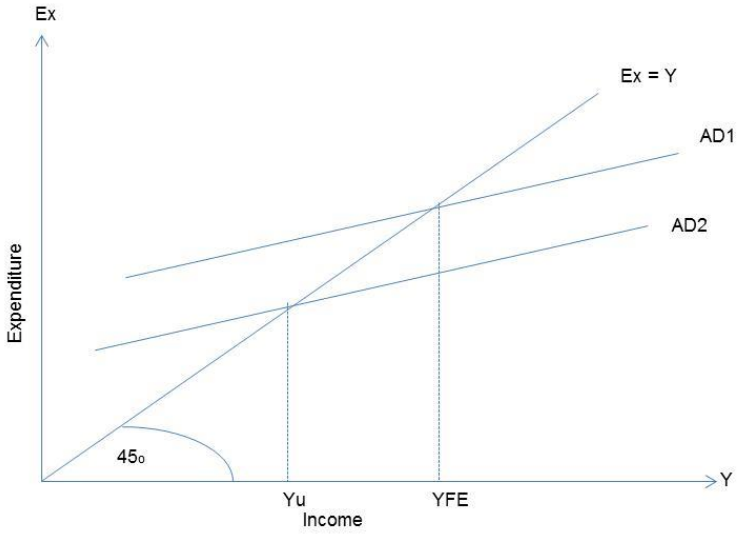
2.6.1.7 Labour market institutions

Unemployment is affected by labour market institutions (LMI), but to a lesser extent than by high interest rates and insufficient capital accumulation. According to Rowthorn (1995:28), the ability of workers to increase wages is reduced due to unemployment because of the excess capacity of workers. "*Labour market reforms will not cure unemployment*" (Stockhammer & Klär, 2011:449). According to Roed (1997:389-418), insider bargaining, skills-loss and queuing are the most common explanations for the persistence of unemployment.

2.6.1.8 Deficient aggregate demand

According to the Keynesian theory, unemployment occurs due to too high real wages. Demand deficient unemployment is a result of low demand for the national output of goods, where the demand can't be met without employing all those who want to work at the prevailing wage rate. This is explained in Figure 2.11.

Figure 2.11: Keynesian unemployment



Source: Dawson (1992).

According to Figure 2.11, full-employment is at YFE and this illustrates the equilibrium where everyone who wants to work is needed to produce output, with a sufficient aggregate demand. Due to a loss in business confidence, reduction in investments or a reduction in public expenditure $AD1$ falls to $AD2$. This will cause a fall in the equilibrium level of national income from YFE to YU, causing involuntary unemployment (Dawson, 1992:43-44).

By expanding the level of economic activity, economic growth is required in order to create sustainable job opportunities.

2.6.2 Employment creation strategy

There are four effective growth strategies that are necessary to promote economic growth, thus reducing the unemployment rate (Cawker & Whiteford, 1993:47-55). The following section provides a brief overview of each of these strategies.

2.6.2.1 Macroeconomic stability

Regardless of the employment creation strategy, macroeconomic stability is of vital importance as instability can wreck even the best laid plans. Therefore, macroeconomic stability is essential for all other economic strategies. There are important aspects to ensure macroeconomic stability, such as:

- The real effective exchange rate and interest rate should be stable;
- There should be an acceptable inflation level;
- Tax structures should be appropriate, because they can suppress the incentives to produce;
- There should be management of the trade balance in terms of imports and exports; and
- Reasonable levels of saving and investment should be encouraged.

The ability to maintain macroeconomic stability will enhance the implementation of development policies usually aimed at creating more job opportunities, hence promoting the general well-being of a population.

2.6.2.2 Labour supply policies

A labour supply policy targets the supply side of labour in an attempt to reduce unemployment. In SA, the labour force is characterised by the following:

- High growth rate of the labour force, therefore more job opportunities are required, thus putting pressure on the economy;
- Skills shortages; and
- An oversupply of unskilled or semi-skilled labour.

All these characteristics increase the supply of labour, but are seen as the "*wrong type of labour*". Reductions in the birth rate as well as the economically active population are part of policies that aim to reduce labour supply. Another policy is aimed at the improvement of the quality of the labour force in order to obtain a more trained and educated workforce, which will contribute to economic success. Without a skilled labour force, costs increase because goods and services are imported, which places strain on the trade balance.

2.6.2.3 Redistributive policies

According to Chenery (1974:287) and Shinohara *et al.* (1983:37), as inequality in income was reduced in East and South East Asia, economic growth started to increase. This occurred because the purchasing and producing power of the country improved. The

redistribution of income therefore not only improves economic growth, but it also improves employment.

The problem with redistribution policies is that they might not respond fast enough to the changes in demand patterns, which may result in macroeconomic imbalances. These imbalances increase inflation, create a deficit in the BOP and reduce real wages. Therefore, small business development is necessary to turn the demand situation into permanent economic benefits.

2.6.2.4 Small businesses development

Small businesses are more labour-intensive and therefore have great potential to increase economic growth and employment creation. The purchasing power of the lower income group can be increased even more if redistribution of income in small businesses is kept within the lower income group.

2.7 SUMMARY

Theories regarding the major macroeconomic variables were discussed to theoretically provide the foundation to determining which of these macroeconomic variables have the largest significant impact on the unemployment rate. It was shown that economic growth plays an important role in reducing the unemployment rate, but may also result in demand-pull inflation due to an increased demand for exports, which was encouraged by a depreciated currency. A depreciated currency would be beneficial to some extent, but it increases the relative price of imports. South Africa is highly reliant on imported manufactured and intermediate goods used in the production process. Depreciation increases the cost of production leading to cost-push inflation. However, this type of inflation hampers production and growth, and therefore also job opportunities.

According to Gill Marcus (2010:10), the President of the South African Reserve Bank, all the factors that lead to an increase in the inflation rate may cause the exchange rate to depreciate. Therefore macroeconomic stability is of vital importance. The ability to maintain macroeconomic stability will enhance the implementation of development policies usually aimed at creating more job opportunities, hence promoting the general well-being of a population.

CHAPTER 3: THE MACROECONOMIC CHANNEL IN SOUTH AFRICA

3.1 INTRODUCTION

According to van der Merwe (2003:37), a formal inflation targeting regime, combined with a flexible exchange rate, was adopted in 2000 in SA. In a country such as SA that is highly reliant on commodity exports and imports of value added goods, currency stability is required to improve international trade and investment. Improving economic growth may lead to a lower unemployment rate. In this chapter the macroeconomic transmission channel will be explained with relevance to the South African economy. The exchange rate, imports, exports, inflation, GDP and the unemployment rate will be described and a trend analysis conducted for each of the variables for the period 2003 to 2013.

3.2 EXCHANGE RATE

South Africa has followed a floating (flexible) exchange rate regime since 1999 in order to achieve greater competitiveness. Therefore the price of the currency is determined by the market forces of supply and demand in the foreign market (Dornbusch *et al*., 2009:46; Farlex Financial Dictionary, 2009:1; Wachtel, 1989:266). This contributes to the volatility of the rand (Frankel, 2008:1; Muller-Plantenberg, 2010:46).

The exchange rate policy is determined by the National Treasury, and the Cabinet together with SARB (SARB, 2008:2). According to van der Merwe (2003:27), general economic stability is more important to SARB than exchange rate stability. To obtain exchange rate stability, different macro and micro economic policies should be applied; however, large movements in international capital markets can make it difficult to achieve this goal. van der Merwe (2004:9) finds that a wrong policy response may be induced when the monetary policy focuses more on exchange rate stability, since it may lead to economic poor performance, and even to a recession.

SARB participates in the currency market by buying or selling other currencies in order to build up foreign exchange reserves. Nonetheless, such reserve accumulation should be seen as international liquidity management, and not exchange rate policy (SARB, 2010:1). Large fluctuations in financial flows can make it nearly impossible for SA to achieve exchange rate stability, complicating decisions involving international trade and competition against imports (van der Merwe, 2004:9). SA's unstable international markets

and fluctuating response dealt a blow recently to incoming foreign investment and export performance. As a result, an export stimulus is critical to stabilise the exchange rate. An increase, especially in local manufacturing and beneficiation, will promote exports revenues and produce a more sustainable growth, which will in turn stabilise the rand (ITRISA, 2010:228). The reasons why SA decided to stay with a flexible exchange rate system, according to van der Merwe (2003:37), are:

- It costs massive reserves to peg the rand to a basket of currencies, therefore there is a risk of failure in sustaining a fixed exchange rate system;
- Requirements to maintain a fixed exchange rate system exists with risk of failure to comply, such as adequate foreign exchange reserves, a well-supervised and regulated financial system, and a business cycle correlating closely with the currency fluctuation; and
- Monetary policy flexibility is lost with dollarisation; making it difficult to determine interest rate levels. As a result, interest rates are determined by reference to other countries, however, without considering domestic economic conditions, which may lead to a reduction in economic growth and a higher unemployment rate.

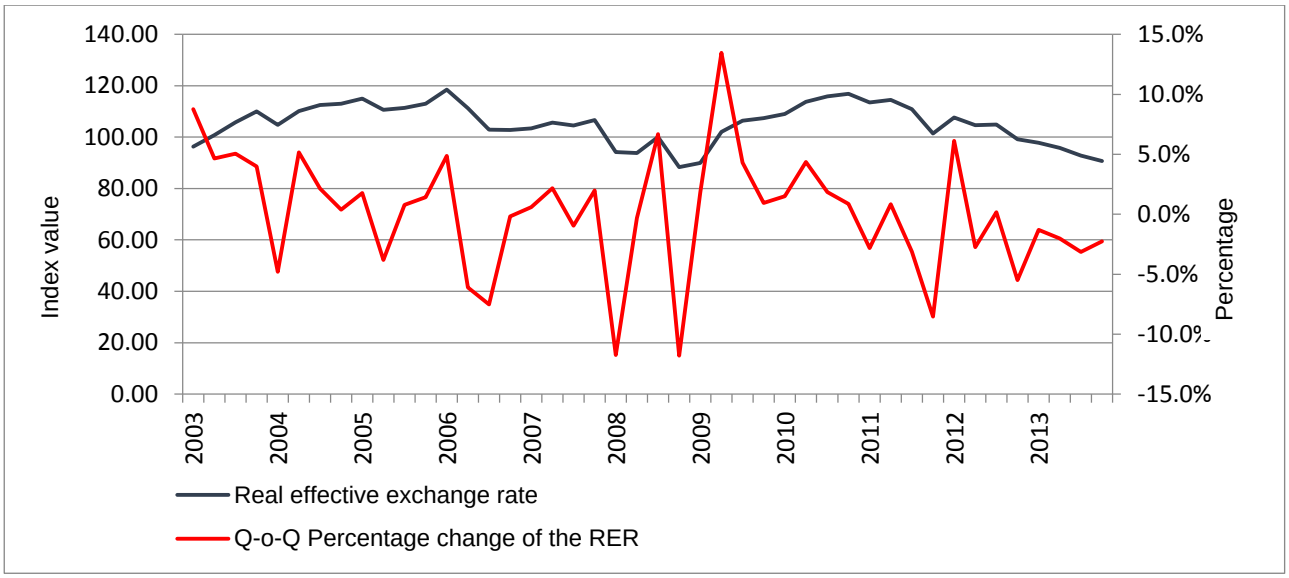
van der Merwe (2003:37) explains that in the current economic situation a fixed exchange rate system is not appropriate. Rand stability is difficult to achieve since SARB focuses on the monetary policy tool of adjusting the Repo rate to attempt to curb inflation. Monetary and fiscal measures can be used by government to reduce the volatility of the rand by considering a managed floating system.

3.2.1 Exchange rate trends in South Africa

The effective (multilateral) exchange rate measures the overall movement of the rand against major currencies (Mohr, 2005:150; Takaendesa, 2006:13). According to SARB (2014d:1), the weighted average of four major banks is used to determine the exchange rate between the South African rand and other currencies. The bank's weights are based on various shares for foreign exchange in the domestic market. The real exchange rate can be defined as the nominal exchange rate adjusted for inflation. The Quarterly Bulletin informs that the weights used in calculation of the nominal and real exchange rate were revised from 1 January 2005 due to the revision in the number of trading partner countries

from thirteen to fifteen. These trading partners represent more than 1 per cent of SA's trade in manufactured goods (SARB, 2008:61). The real effective exchange rate is an index constructed to reflect the average between fifteen trading partners in their trade in manufactured goods (IMF, 2014:1). The monthly data on the real effective exchange rate information was obtained from SARB and was transformed into quarterly averages for the period starting the first quarter of 2003 to the fourth quarter of 2013.

Figure 3.1: The real exchange rate from 2003 to 2013



Source: SARB (2014d), author's calculations.

From Figure 3.1 an overall depreciation in the exchange rate from beginning 2003 to beginning 2006 is visible. The exchange rate started to appreciate from beginning 2006 to late 2008, again depreciating from late 2008 until mid-2010, thereafter following an appreciating trend. The year on year percentage change from 2003 to 2004 was 155%, mainly due to rising foreign prices of export commodities, a decline in the interest rate, an improvement in the foreign currency positions, as well as a prudent monetary and fiscal policy (SARB, 2003:28-29). A positive credit rating of two international credit rating agencies, an attractive interest rate, a moderate inflation rate and an improvement in the terms of trade led to a stronger exchange rate in 2004. However, during the third quarter of 2004, the exchange rate started to depreciate due to the unexpected interest rate reduction by the monetary policy committee (MPC).

The high volatility in the real exchange rate (RER) has a negative impact on the resource allocation as well as business and investor confidence (SARB, 2004:29). From the end of 2007 to 2009, the RER showed dramatic increases and decreases. The biggest movements in the quarter on quarter percentage change in the RER were recorded when global financial markets were unsettled from the third quarter of 2007 until the second quarter of 2009. This unsettling was due to considerable losses in the United States (US) sub-prime mortgage market, leading to higher levels of uncertainty and risk premia. The exchange rate depreciated by 3.2% in 2007, however, when it was clear that emerging markets were not directly affected by the eruption in the international turmoil, the rand recovered dramatically by 11.7% in the first quarter of 2008 as compared with the previous quarter.

An appreciated currency can be very costly to the SA economy because exports are discouraged by the appreciated trend (Brereton, 2010:1). The RER appreciated by 13.5% in the second quarter of 2009 on a quarter to quarter basis. From 2009 to 2011 the quarter on quarter percentage change in the RER showed an appreciating trend. Since the first quarter of 2009 to the fourth quarter of 2011, the RER increased by 12.8%, causing the rand to weaken. This weakening of the rand increased SA competitivenss in international markets, reduced volitility in the rand and increased stability in business opperations. During 2010, the rand was less volitile than the pervious period. The recovery in the exchange rate was mainly a result of large inflows of foreign portfolio capital, the weakness in the US dollar, and high commodity prices (SARB, 2010:35).

In an emerging market like SA there is an absence of general risk aversion where continued capital inflows are expected (Marcus, 2010:8). This is why the Minister of Finance and SARB concluded that they would take steps to contradict the volatility of rapid capital inflows, which stimulates investments, but causes the rand to depreciate (Gordhan, 2010:11-12). During 2012, the rand depreciated by 5.4% due to certain unique developments in the South African economy (SARB, 2012:38), these include:

- The mining sector’s labour unrest and illegal strikes;
- The downgrading of sovereign ratings;
- A rising trade deficit shown by economic data; and
- Increases in inflation.

Although the depreciation occurred due to unwanted local developments, it improved exporters' international competitiveness. From the first quarter of 2012 to the fourth quarter of 2013 the RER declined by 15.7%. The improvement in the value of the rand led to a market improvement in price competitiveness of South African exporters in the international market. In the next section, imports and exports in the BOP will be explained in the South African context.

3.3 BALANCE OF PAYMENTS

The National Treasury has undertaken an expansionary fiscal policy due to the economic slowdown during 2008 (Laubscher, 2010c:1). An expansionary fiscal policy involves the government in lowering taxes and increasing government expenditure (ITRISA, 2010:108). An expansionary fiscal policy is aimed at stimulating the economy, thus contributing to economic growth and creating more job opportunities, consequently causing economic development. The BOP deficit for the fiscal year of 2009/10 was 6.8% of GDP that the increase in the BOP deficit resulted in due to a reduction in the tax revenues. Tax revenues were reduced to diminish the impact of the recession on the citizens of SA (Laubscher, 2010c:1). According to Preuss (2013:1), the BOP recorded a R1.15 billion surplus, however, during the second quarter of 2013, a deficit of R15.15 billion were recorded. The large deficit was mainly a result of the deterioration in the gold price, as well as the large repayment of a government loan in May 2013.

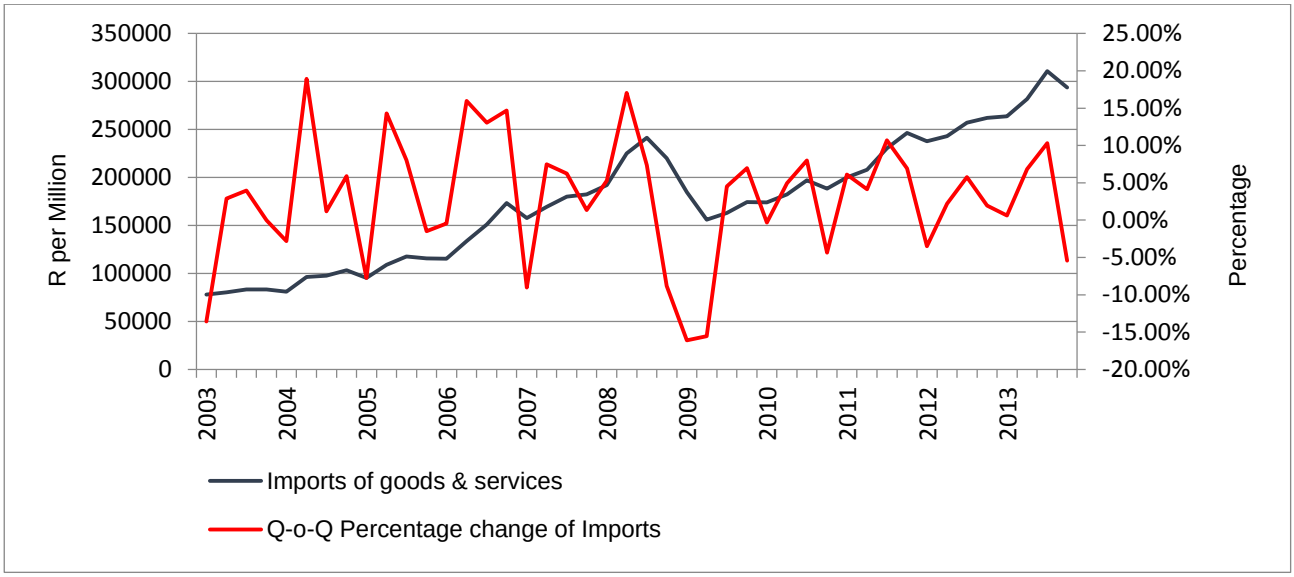
According to Cawker and Whiteford (1993:23-32), international trade and conditions affecting the BOP do have an effect and can constrain the performance of economic growth in a country. For foreign exchange earnings to exceed foreign exchange spending, a positive balance should be maintained. There is a negative relationship between imports and economic growth. Increases in imports cause the BOP to increase, because foreign exchange is needed to finance imports thus reducing current foreign reserves. Net capital inflows, such as foreign loans or investments, are necessary to prevent foreign exchange losses during economic growth periods. Increases in exports and foreign investments are required to increase foreign exchange earnings, thus leading to an increase in foreign exchange reserves and improving the BOP.

3.3.1 Trends in merchandise imports and exports in South Africa

According to the IMF (2014:1), South African data regarding the balance of payments are sourced from the Declaration (SAD 500), which is then submitted by importers and exporters. After the data is firstly released in SARB publications, the data are revised during the next month when more accurate data is available.

In general, imports consists of "*Commodities of foreign origin as well as goods of domestic origin returned to South Africa with no change in condition or after having been processed and/or assembled in other countries*", whereas, "*exports measure the value of merchandise that physically leaves South Africa*" (IMF, 2014:1). Data is published by the SARB on a quarterly basis, and indicated in terms of millions of South African rands of imports and exports, which have to comply with the Custom Union of SA. The quarterly average values on the merchandise imports and exports were obtained from SARB since the first quarter of 2003 to the fourth quarter of 2013.

Figure 3.2: Merchandise imports from 2003 to 2013



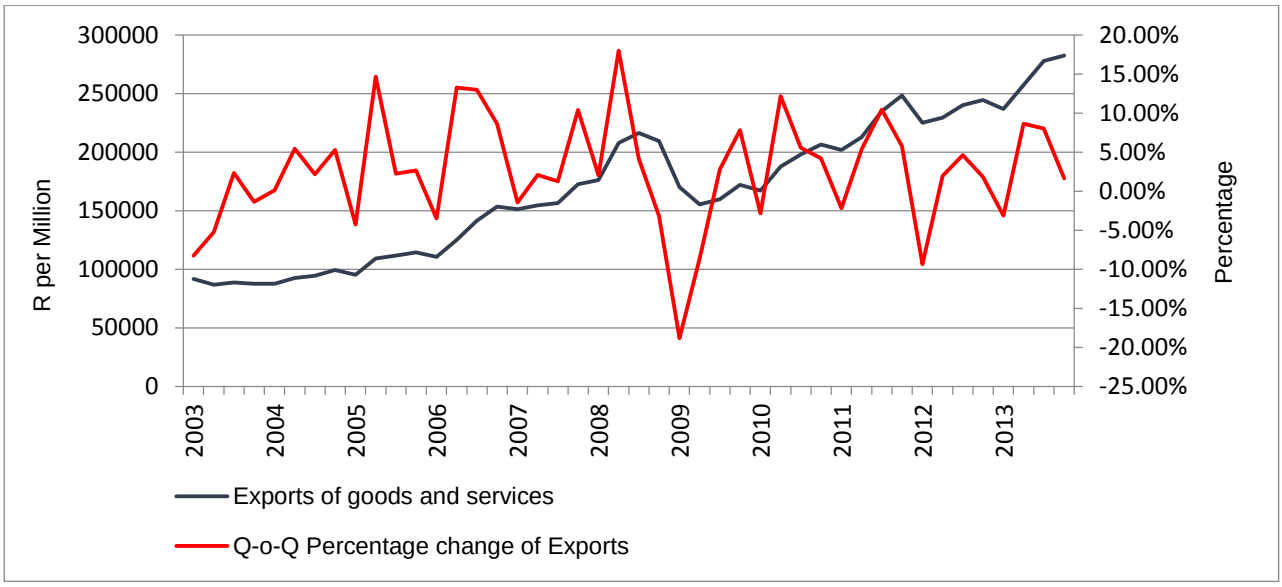
Source: SARB (2014c), author's calculations.

Figure 3.2 shows an overall nominal increase in the value of merchandise imports from 2003 until 2013, although during mid-2008 a sharp reduction took place, again gaining momentum from beginning 2009. A sharp increase of 6.9% in merchandise imports were recorded in 2003 mainly due to stronger than expected domestic demand for both

consumer and capital goods (SARB, 2003:2). Merchandise imports increased dramatically by 18.9% on a quarterly basis in the second quarter of 2004 due to the strengthening in the external value of the rand. On a yearly basis, merchandise imports followed a sharp decline of 17.6% in the first quarter of 2005. The sixth consecutive quarterly deficit in SA's trade balance was recorded in the third quarter of 2005, the large deficit can be ascribed to the flexibility of real domestic expenditure, which in turn increases the value of merchandise imports (SARB, 2005:21).

Imports increased by 7.4% in the second quarter of 2007, when compared to the first quarter, as a result of higher capital expenditure leading to a rise in the prices of imports, which surged further due to the international prices of crude oil (SARB, 2007:2). During the second quarter of 2008, imports increased by 17.1% on a quarterly basis, however, in the first quarter of 2009 imports dramatically declined by 16.1%. The main reason for the reduction was the sharp depreciation in the rand. Imports increased in 2010 by 8.4% mainly due to an increase in domestic demand, while imports increased by 6.3% in 2012 and by 12.2% in 2013. However, during the fourth quarter of 2013, the value of imports started to decline by 5.4% on a quarter on quarter basis.

Figure 3.3: Merchandise exports from 2003 to 2013



Source: SARB (2014a), author's calculations.

Figure 3.3 indicates an overall increase in the value of merchandise exports from 2003 until 2013, although during mid-2008 a sharp reduction took place again, gaining

momentum from beginning 2009. During 2003, merchandise exports rose significantly, together with rising export commodity prices, which resulted in an improvement in the trade deficit on the current account of the balance of payments (SARB, 2003:2). The surplus in the trade balance in the third quarter of 2004 was mainly a result of the improvement in SA export performance, with a 4.5% increase in the value of merchandise exports in the third quarter, as compared to the previous quarter (SARB, 2004:22). In the first quarter of 2005, exports declined by 4.3%, while increasing dramatically by 16.7% in the second quarter. The sharp increase in the second quarter of 2005 is mainly the outcome of a higher global demand.

During the second quarter of 2006, the rand started to depreciate due to a reduction in export commodity prices and the global risk aversion towards emerging-market countries. After this, it weakened further in the third quarter due to the prolonged trade deficit and uncertainty among foreign investors (SARB, 2006:28-29). As a result, export volumes increased strongly, which increased export earnings by 16% in the third quarter of 2006. This was due to a higher global demand and the depreciated currency, which increased the competitiveness of exporters, and thus led to a smaller trade deficit (SARB, 2006:2).

According to SARB (2007:2), exports showed a marginal decline in the third quarter of 2007, however, the trade deficit widened to 8.1% of GDP, which was considered to be the highest since the first quarter of 1982. During the second quarter of 2008, the largest quarter to quarter percentage change was recorded where exports increased by 18%, thereafter dropping to its lowest point in the first quarter of 2009 at 18.8%. According to Sapa (2010:1), SA's current account deficit narrowed in 2009 due to an increase in international trade volumes and a rise in the value of merchandise goods exported from SA. This caused the rand to appreciate in 2010. During the first quarter of 2012, the value of merchandise export decreased by 9.3% as compared to the previous quarter. Exports increased by 15.5% in the fourth quarter of 2013 on a year-on-year basis. In the next section inflation will be explained in the South African framework.

3.4 INFLATION

According to the South African Reserve Bank (SARB) (2010:1), their primary goal is to achieve and maintain price (financial) stability. Financial stability can be seen as an

important condition for sustainable economic growth and employment creation (Bezuidenhout, 2010:1). Financial stability, according to Bezuidenhout (2010:1), allows smooth operation in the economic system by creating:

- A regulatory infrastructure;
- Effective and well-developed financial markets; and
- Sound and efficient financial institutions.

Price stability is the primary role of monetary policy, although global unemployment, underemployment and poverty are critical world issues which take centre stage (Epstein, 2009:1; SARB, 2010:1). A flexible inflation targeting system was adopted by SARB in February 2000. The inflation rate was initially measured by the consumer price index (CPIX), which is the "*CPI for metropolitan and other urban areas, excluding the interest cost on mortgage bonds*" (SARB, 2008:1). When evaluating the effects of monetary policy, SARB revised their methodology in compiling the CPI, which changed the treatment of housing, thereby removing mortgage interest costs from the CPI. Although this is effective in achieving price stability, it can damage economic growth, as well as employment opportunities (Cordero, 2008:145; van der Merwe, 2004:5). SARB has held the view that low inflation (brought about by a curb in consumer spending) and exchange rate stability (brought about by enhanced foreign investment) will do more to encourage long term economic growth (ITRISA, 2010:227).

The headline CPI is used to specify target range of inflation; however, in 2005 the targeted range of 3% to 6% was set due to a sharp depreciation in the rand together with a number of exogenous shocks (van der Merwe, 2004:6). In the Medium Term Budget Policy Statement, the Minister of Finance announced on 21 October 2008 that the inflation target "*range of 3 to 6 percent for the year on year increase in the headline CPI for all urban areas*" should be set, which took effect on 25 February 2009 (SARB, 2008:1)

SARB has achieved considerable success with inflation targeting by bringing the inflation rate down to lower levels, as well as substantially improving the transparency and accountability of monetary policy (Bernanke *et al*., 1999: 26; van der Merwe, 2004:8). According to van der Merwe (2003:29) and Stiglitz (2008:1), inflation targeting seems less appropriate for an emerging economy such as SA for the following reasons:

- SA's sensitivity to external shocks in the economy;
- SA's dependence on international capital flows;
- A less developed financial infrastructure; and
- Central banks are not self-sufficient to apply the inflation targeting regime in a credible manner.

Despite this, inflation targeting was introduced and applied by the South African government and SARB through sophisticated information and communication systems. However, in an annual conference in 2010, Marcus (2010:2), the President of SARB, stated that the success of global inflation targeting was the reason for the 2008/2009 global financial crisis. Due to low global inflation and its narrow focus, banks were allowed to keep the interest rate at low levels, which contributed to excessive credit extension and asset bubbles in the housing and equity markets. The problem with inflation targeting is that the focus is on stabilisation, rather than growth and development (IMF, 2006:1).

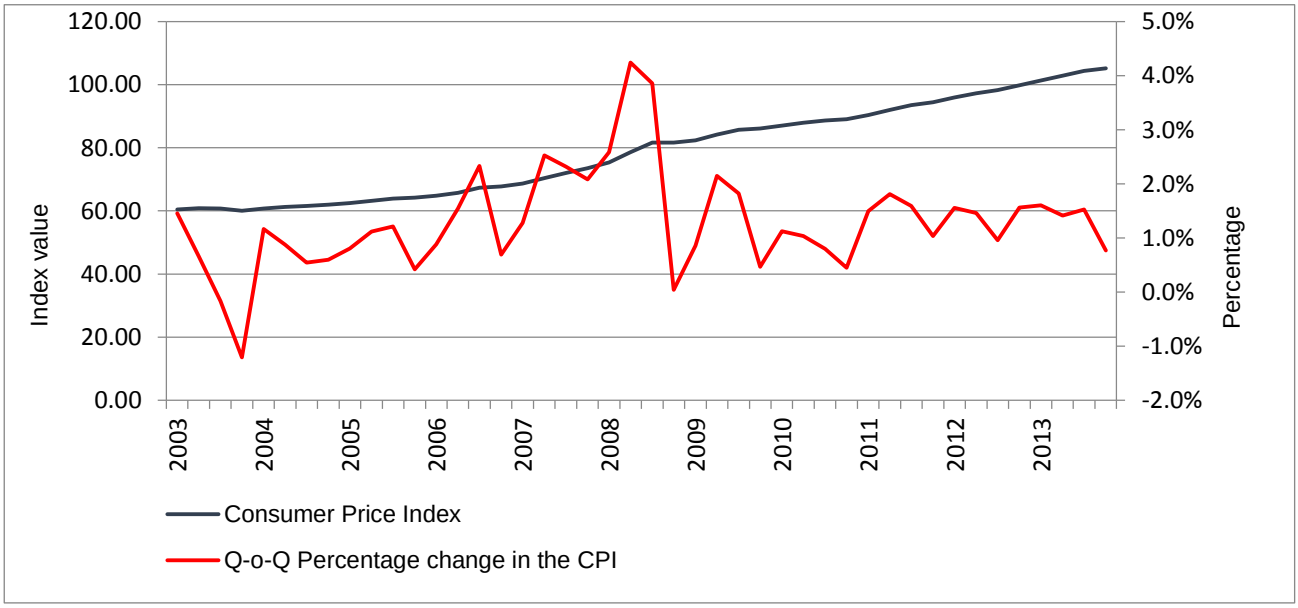
According to Stiglitz (2008:1), higher food and oil prices represent a larger share in the household budget in SA, contributing to the high inflation rate. Since most of these good are largely imported, raising the interest rate to counteract inflation will not have any impact. SARB's response to increase interest rates only reduces aggregate demand, which will slow the economic activity and thereby tame prices, but it will not bring inflation down to the targeted level. It is important for SA to find alternatives to an inflation-focused monetary policy, which can be used for stabilisation and developmental needs to keep inflation moderate and maintain the exchange rate (Epstein, 2009:12). As a result, Stiglitz (2008:1) suggests that inflation targeting needs to be abandoned by developed and developing counties since it brings a weaker economy, higher unemployment and rising food and energy prices. The inflation targeting regime makes it more difficult, especially for households, to survive in these circumstances.

3.4.1 Inflation trends in South Africa

The CPI is an index constructed to reflect the average of all the items in the CPI for the total country (IMF, 2014:1). The CPI is the weighted sum of prices, where the prices of specific goods and services are updated on a monthly basis. Conversely, weights are only updated every five years. Stats SA is responsible for the official measurement and release

of the CPI. In November 2012, Stats SA selected a new basket of goods and services based on results from the 2010/2011 income and expenditure survey (IES) (QES, 2013:21). To calculate the CPI, the current and previous prices are needed. In January 2013, the CPI was rebased so that December 2012 equals 100, thereby becoming the new base period (IMF, 2014:1; QES, 2013:37). For this study, the monthly data on the CPI was obtained from Stats SA, which was transformed to quarterly averages for the period of the first quarter of 2003 to the fourth quarter of 2013. The CPIX (CPI excluding interest rates on mortgage bonds) was discontinued in 2009, therefore inflation data for this study was constructed from the results of the CPI as published by Stats SA (QES, 2013:5).

Figure 3.4: The consumer price index from 2003 to 2013



Source: Stats SA (2014a), author's calculations.

Figure 3.4 indicates an overall increase in the CPI from 2003 up until 2013, although during the end of 2003 the lowest quarter-on-quarter rate, i.e. pace in change, was recorded. In contrast, at the start of 2008, the highest quarter-on-quarter increase took place receding at the end of 2008, where after it recorded a moderately steady state from the beginning of 2009 to 2013.

However, in September 2003 the inflation rate declined to an annual rate of 5.4% receding further in October 2003 to 4.4%. The rapid reduction in inflation was mainly attributed to a lower repurchase rate (contractionary monetary policy) as well as the recovery in the

exchange rate (SARB, 2003:2). A modest acceleration in annual inflation was recorded in 2004, mainly due to higher energy prices, buoyant commodity prices and smaller output gap. Due to the strengthing of the rand and moderante price pressures, the inflation rate remained in its targeted range for 14 successive months (SARB, 2004:1). Annual inflation increased to 6% in the third quarter of 2006 due to the combined effect of increases in fuel and food prices. In the third quarter of 2006, as compared to the first quarter of 2005, inflation increased by 8.4% (SARB, 2006:3). According to SARB (2007:2), in all the MPC meetings in 2007 the repurchase rate was increased by 50 basis points in order to pervent acceleration in the rate of inflation.

Monetary policy goals for 2009 were to bring inflation, which had peaked at 11.5% on an annual basis in 2008, back to within the 3-6% target band set by inflation targeting. The contraction of domestic demand, decrease in imported food, oil inflation, strong currency and the re-basing of the index in January 2009 all helped lower inflation to 7.1% in 2009. On an annual basis, the CPI increased by 11.1% in the forth quarter of 2009. The reason for the sharp increase in the annual percentage change in the CPI is due to the global finacial crisis, which resulted in a slowdown in the world economic growth and a significant reduction in commodity prices. This caused a rise in energy and food prices together with higher electricity prices granted to Eskom (Marcus, 2010:10). However, due to high wage settlements and a rise in electricity prices by one third, inflation breached the target range again. Still, the lower inflation rate allowed SARB to put more emphasis on fighting the recession (Bester, 2010:1).

Despite the expected rebound of international prices for food and oil, a gradual weakening of the currency and the base effect of the passed electricity price hike, inflation decelerated to a year-on-year rate of 5.2% in October 2010. In October 2011, year-on-year CPI accelerated once again to 6%. The reason for this increase is attributed to higher food and transport costs. In the fourth quarter of 2013, CPI declined marginally to record a 5.4% year-on-year rate, mainly due to a depreciated currency. In the next section, economic growth will be described in the South African background.

3.5 ECONOMIC GROWTH

According to Laubscher (2010a:1), growth possibilities in SA can be crucially affected by the domestic structural reforms and cannot rely on international windfalls to sustain the economy. SA' s growth potential will be limited to the growth in domestic demand, therefore import replacement as a development approach is needed in order to increase economic growth. Low levels of fixed investment constrain economic growth. Factors that constrain the level of investment include the following (Laubscher, 2010b:1):

- Sanctions;
- Political and social instability;
- Uncertain potential investors;
- Interest and exchange rate volatility; and
- High company taxation.

Sanctions restrict international trade, but also restrict access to foreign technologies. Due to political unrest and uncertainty, investments were reduced; and many skilled people also emigrated, which caused a "*brain drain*" (Cawker & Whiteford, 1993:23-32). Thus, political, social and economic stability is necessary to increase future investments in SA.

3.5.1 Policies promoting economic growth in South Africa

Different types of policies were developed in SA to promote economic growth in SA post-1994. The most recent policy, the national development plan (NDP), was most recently implemented on 19 February 2013 to promote economic growth. In the following section, a few policies will be discussed briefly.

3.5.1.1 Accelerated and Shared Growth Initiative for South Africa

The exchange rate is seen as one of the factors constraining accelerated growth in SA according to the accelerated shared growth incentive for SA (ASGI-SA) policy (Boshoff, 2008:1). SA imposed this growth initiative to achieve faster output and higher levels of export growth (ITRISA, 2010:230). ASGI-SA aimed to achieve a sustainable economic growth rate of 6% in 2014 in order to:

- Decrease the unemployment rate; and

- Expand local and export-led production.

Due the 2008/09 recession, it is highly unlikely for SA to achieve a growth rate of 6% anytime soon (ITRISA, 2010:231).

3.5.1.2 Industrial policy action plan

According to Laubscher (2010b:1), as pointed out by Rodrik (2008), one of the agendas of ASGI-SA, is the industrial policy that advises the South African government to focus on the industrial policy issues. After the adoption of the industrial policy, SA embodied a more active industrial policy, namely the industrial policy action plan (IPAP), which was released for 2010/11 to 2012. A brief summary of SA's IPAP objectives follows, as stated by Laubscher (2010b:1) and Davies (2010:3):

- Diversification beyond traditional commodities and nontradable services, requiring the promotion of increased value addition;
- The long-term intensification of SA's industrialisation process and movement towards a knowledge economy;
- The promotion of a more labour-absorbing industrialisation path;
- The promotion of a broader-based industrialisation path characterised by the increased participation of historically disadvantaged people and marginalised regions in the mainstream of the industrial economy; and
- Contributing to industrial development on the African continent.

According to these objectives, it can be seen that the main focus of IPAP was on growing the manufacturing sector, although the utilisation of the services sector was not seriously considered. This can be regarded as the leading sector in achieving economic development.

Although the industrial policy in SA aims to grow the share of the manufacturing sector in its economy to enhance economic growth, industrial policy should be aligned with factor markets, which may contribute to the available skills, FDI, technology transfer, infrastructure and support institutions. Therefore it can be said that "*soft*" policies aimed at increasing productivity by increasing the supply of skilled workers, encouraging

technological adoption, and improving regulation and infrastructure, stand a better chance of enhancing welfare, and thereby economic growth and development (Davies, 2010:16).

3.5.1.3 Export-led growth

Export led growth is an economic development strategy of which exports and foreign trade play a significant role in a country's economic growth and development (Perkins *et al.*, 2006:661; Sentsho, 2000:2). Export led growth leads to higher output, employment and consumption, which all lead to an increase in the country's output, which can in turn affect the country's GDP growth (Mahadevan, 2007:1). Where it can be used to improve and develop areas in order to achieve a comparative advantage, primary export-led growth helps an economy to utilise more of its available factors of production and to improve the efficient use of those factors. Increasing the production in a sector leads to an increase in demand for other sectors, which results in more broad-based economic growth. According to ITRISA (2005:75) and Devarajan (2008:1), the government must do the following in order to promote exports:

- Offer bank loans at favourable interest rates so that producers can obtain working capital for their export activity;
- They must introduce periodic currency devaluations to keep exports competitive in foreign markets;
- Relax trade barriers, such as import tariffs, and the insufficiently emphasised need to improve trade logistics, infrastructure, business competition, and regulation;
- Invest in infrastructure such as rail, road and port upgrading; and
- To discourage trade union activities in order to keep wages low, which can decrease production cost.

Thus it can be seen that most of these policies require a small depreciation in the exchange rate to boost exports, consequently impacting the BOP.

3.5.1.4 National Development Plan

The national development plan (NDP) was first introduced on 15 August 2012 by Manuel, a Minister in the national planning commission (NPC). According to Manual in his launch speech, "*it is a plan for a better future; a future in which no person lives in poverty, where*

no one goes hungry, where there is work for all, a nation united in the vision of our Constitution"(SAGOa, 2012:1).

The NDP was implemented on 19 February 2013 providing a long term perspective by identifying the roles of certain sectors to reach its goals. The main goal of the NDP is to eliminate poverty and reduce inequality by 2030. By growing an inclusive economy, these goals can be realised by building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society (SAGOb, 2012:1). There are two high level objectives which were identified by the South African Government Online (SAGO). These include (SAGOc, 2012:1):

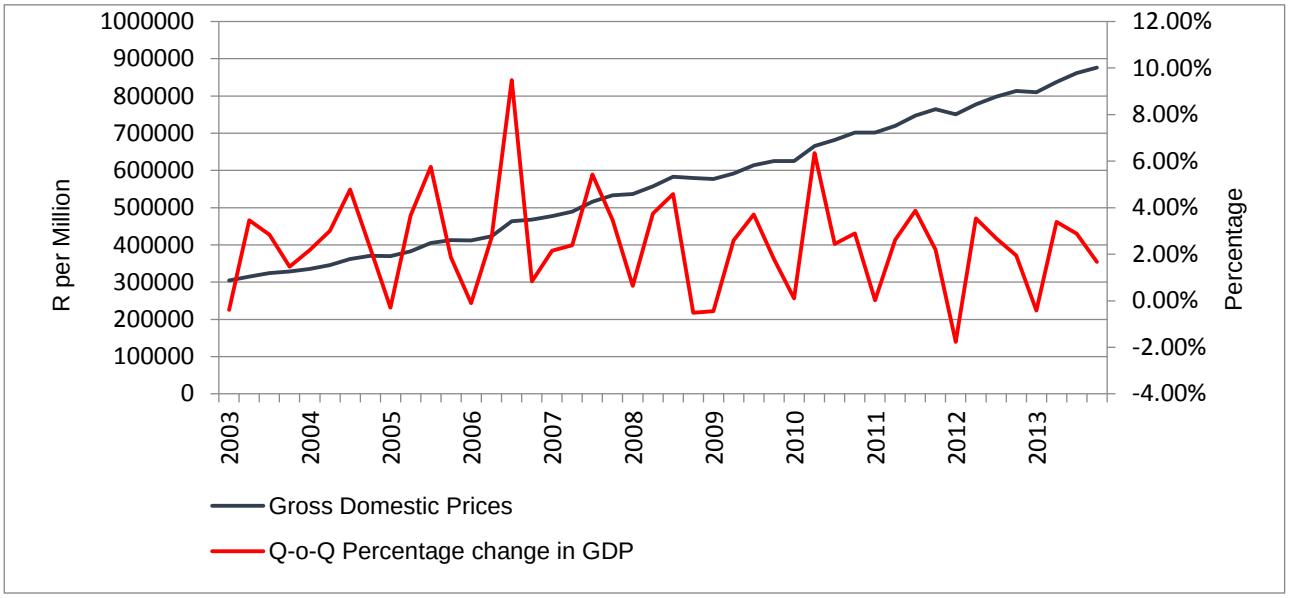
- To reduce the number of people who live in households with a monthly income below R419 per person (in 2009 prices) from thirty-nine percent to zero; and
- To reduce inequality, as measured by the Gini coefficient, from 0.69 to 0.6.

The NDP is based on the cycle of development, especially in the quality of education, in order to ensure a bigger worker base that will expand opportunities, build capabilities and raise living standards (SAGOc, 2012:1).

3.5.2 Economic growth trends in South Africa

South Africa's GDP is published by SARB as calculated from the demand-side of the economy and is calculated on a quarterly basis. The GDP as calculated from the supply-side of the economy is provided by Stats SA. This study employs the quarterly GDP at market prices (at current prices), also known as nominal GDP, which is expressed in monetary values in terms of millions of rands (Mohr *et al*., 2009:61). By using the nominal GDP, the size of the economy during a specific period can be measured, however, the nominal GDP does not incorporate changes in inflation.

Figure 3.5: The gross domestic product from 2003 to 2013



Source: SARB (2014b), author's calculations.

Figure 3.5 indicates an overall increase in the GDP from 2003 until 2013, although during mid-2006 the highest quarter-on-quarter rate was recorded, declining at the beginning of 2012 to the lowest quarter-on-quarter rate for the period. According to SARB (2003:1), the South African economy decelerated bringing a growth rate of only 0.5% in the second quarter of 2003. This was mainly due to the poor performance in the agricultural and manufacturing sector. On a quarterly basis, the nominal GDP increased by 4.8% in the third quarter of 2004. These increases are largely attributed to an expanded real agricultural production, as well as increases in the production volumes in the mining sector (SARB, 2004:2). In the third quarter of 2006, nominal GDP increased by 9.48 % when compared with the previous quarter, however, the economy lost some of its momentum in the fourth quarter of 2006. The main reasons for the decelerated growth rate are higher domestic prices, tax collections and other supply side constraints in the economy (SARB, 2006:1).

A quarter-on-quarter decrease of 0.5% was recorded in the first quarter of 2009, which caused nominal GDP to decrease. This reduction was mainly due to a deterioration in global demand, a sharp reduction in commodity prices and sluggish growth in major goods-producing sectors (SARB, 2008:4). In the first quarter of 2012, the nominal GDP declined by 1.8% recording the lowest quarter-on-quarter rate for the period. This was

mainly as a result of the contraction in the mining sector due to the violent strikes at the major platinum mines and the slowdown in agricultural production (SARB, 2012:1). Nominal GDP increased by 7.7% in the fourth quarter of 2013 at an annualised rate, although growth slowed down marginally when observing the quarterly percentage change in GDP. The reduction in the third and fourth quarter of 2013 was caused by a contraction in manufacturing production in the vehicle and component industries, and labour disruptions in the mining sector (SARB, 2013:1). In the next section the unemployment rate will be described in the South African context.

3.6 UNEMPLOYMENT

Unemployment is a growing concern, especially in SA, which is a political as well as a macroeconomic problem (Cawker & Whiteford, 1993:2; Doğrul & Soytas, 2010:1523). A total of 1.1 million jobs were lost during the recession; emphasising the need in SA for long term solutions to reduce the unemployment rate with the right macroeconomic policy (Laubscher, 2010c:1). According to ITRISA (2010:228), the unemployment rate in SA is 25,3%, together with the discouraged workforce it ranged at about 40% in 2009. This worsened poverty even further causing urban decay, disease, the collapse in moral standards and crime. 500 000 people lost their jobs in 2009 due to the economic downturn. As recorded by StatsSA, the official unemployment rate increased from 24.9% in the fourth quarter of 2012 to 25.2% in the first quarter of 2013 leaving 4.6 million people unemployed (Sapa, 2013:1). According to the quarterly labour force survey (QLFS) (2014:6) which is compiled by Stats SA, the unemployment rate decreased by 0.4% on a quarterly basis to 24.1% in the fourth quarter of 2013. The reduction was mainly as a result of increased employment opportunities in the informal and formal sector.

By expanding the level of economic activity, economic growth is needed to create sustainable job opportunities. According to Cawker and Whiteford (1993:23-32), apartheid policies discriminated against non-whites where these policies applied to education spending and to the labour markets. This created high rates of unemployment, which were very unevenly distributed among population groups. The destabilisation of communities through forced removals contributed to the vicious cycle of "*poverty-unemployment-poverty*". The economy was positively affected by the lifting of these policies, although educational inequalities will continue thereby constraining growth.

3.6.1 Factors constraining employment creation in South Africa

3.6.1.1 Population growth

In developing countries, 40% of the population are under the age of 15, this places a tremendous burden on the economically-active section of the population to support the dependants. As a result, more government expenditure is required in non-productive areas, such as health and education where less is allocated in infrastructural development. SA has a poor saving rate, this means that spending exceeds income (Laubscher, 2010b:1). Saving plays an integral part in economic growth because the more people save, the more money is available for business, for borrowing, to expand, and therefore, more job opportunities are created contributing to wealth creation. Thus, if the economy grows slower than its population, it will contribute to poverty and distorted income distribution. A set of three national poverty lines were established in 2012 by SA, these include: the food poverty line (FPL), lower-bound poverty line (LBPL) and the upper-bound poverty line (UBPL). By using CPI price data, the rand value in each of the poverty lines can be updated on an annual basis (Stats SA, 2014:7).

The global financial crisis had a dramatic impact on the livelihoods of SA's poorest, resulting in 27.8 million people being poor in 2009, which is an increase from the 27.1 million recorded in 2006. According to Stats SA (2014c:12), the percentage of the population that is poor improved from 56.8% in 2009 to 45.5% in 2011, decreasing to 23 million people in 2011. This dramatic reduction in poverty ranged from the growing social safety net, above inflation wage increases, income growth, decelerating inflationary pressures and an expansion of credit. The lower-band poverty line was adopted by the national planning commission (NPC) in 2011 in order to achieve the targets outlined by the NDP. In order to achieve the target of eliminating poverty by 2030, R31.7 billion per annum will be needed to eliminate the poverty experienced by 32.3% people living below this poverty line (Stats SA, 2014c:14).

3.6.1.2 Education

One of the key elements of successful industrial policies has been their focus on the transfer, absorption, diffusion and development of technology (Laubscher, 2010b:1). SA lacks sufficient technical skills to improve and contract infrastructural improvements in

suitable entities. According to Laubscher (2010b:1), these improvements needed to absorb the technological advancements in the economy. This is dependent on the quality of human capital, which is dependent on education and skills development, although SA is not well developed in this regard.

According to BuaNews (2010a:1), the Minister of higher education and training, Blade Nzimande, introduced higher education laws, skills development levies and higher education and training laws amendment bills. Due to a lack of proper education, and an enthusiasm to positively shape the youth in the secondary schooling system, combined with poor salaries and little redress for unsatisfactory performance, this worsens the situation. Nzimande said "*We also intend accelerating our efforts in dealing with some of the fundamental challenges in the system, including skills bottlenecks, especially in priority and scarce skills, low participation rates, distortions in the shape, size and distribution of access to post-school education and training, and quality and inefficiency challenges*" (BuaNews, 2010a:1). Nzimande explained that the transformation and expansion of the higher education and training landscape would have a direct effect on the government's overall mission for economic growth and development. According to Kelly (2014:1), the results from the world economic forum (WEF) global competitiveness report portrayed a negative outlook were SA slipped from 52nd place in 2012 to 53rd place in 2013, with education still a key concern. Ndayi (2014:1) described SA's education crisis as a matter of "*national security*" after the WEF report in 2014, explaining how poor educational standards might lead to labour inefficiency and a higher unemployment rate, which may deplete SA's national integrity.

3.6.1.3 Urbanisation

High population growth and a rising unemployment rate are the key factors in the growth of cities. As a result, cities' BOP and resources are being stretched to the limit, while urban immorality has become an increasingly common event (Laubscher, 2010b:1). Political instability and poor economic prospects have contributed to the large migration of foreigners from other southern African countries to SA.

3.6.1.4 Health

A low standard of living and a lack of sophistication can contribute to health problems in terms of poor nutrition, and funds, although often inadequate, are available to treat disorders. This in turn leads to a low average life expectancy in SA. Such health problems drain SA's financial resources and also lead to erosion in the country's productive capacity (Laubscher, 2010b:1). According to Erasmus (2013:1), life expectancy increased to 59.6 in SA, this is derived from Stats SA's mid-year population estimate in 2013. Although the life expectancy increased in SA, the total number of people living with HIV has gone up with more than a million from 2002 to 2013, to about 5.26 million in 2013.

3.6.1.5 Political stability

SA is extremely dependant on foreign direct investment (FDI) in order to achieve sustainable economic growth. The level of FDI is dependent on political stability in a country. In 2008, there was a large outflow of portfolio investment due to a large number of nervous foreign investors. According to BuaNews (2010b:1), the Deputy President, Kgalema Motlanthe, stated that "*We are consolidating our economic infrastructure; we have transparent and legally sound licensing arrangements, and investors are guaranteed security of tenure*". According to the United Nations conference on trade and development (USCTAD) as cited by Sapa (2014:1), between 2011 and 2012, FDIs decreased by 24%, the reduction was primarily due to the net disinvestment in a foreign mining company. In 2012, SA represented 9.1% of Africa's total FDI inflows, making SA the third-largest recipient of FDIs.

3.6.1.6 Productive capacity and international trade

Efficiency and competitiveness can experience a major setback due to power outages, water disruptions, clogged highways and congested airports and seaports, which are some of the major challenges to government. According to SAinfo reporter (2010:1), ABB, who is a multinational power and automation technology group, won an order from Eskom to provide a plant solution for the Ingula Pumped Storage Scheme currently under construction on the border of the Free State and KwaZulu-Natal. ABB global power generation business head Franz-Josef Mengede said in a statement, "*The Ingula project*

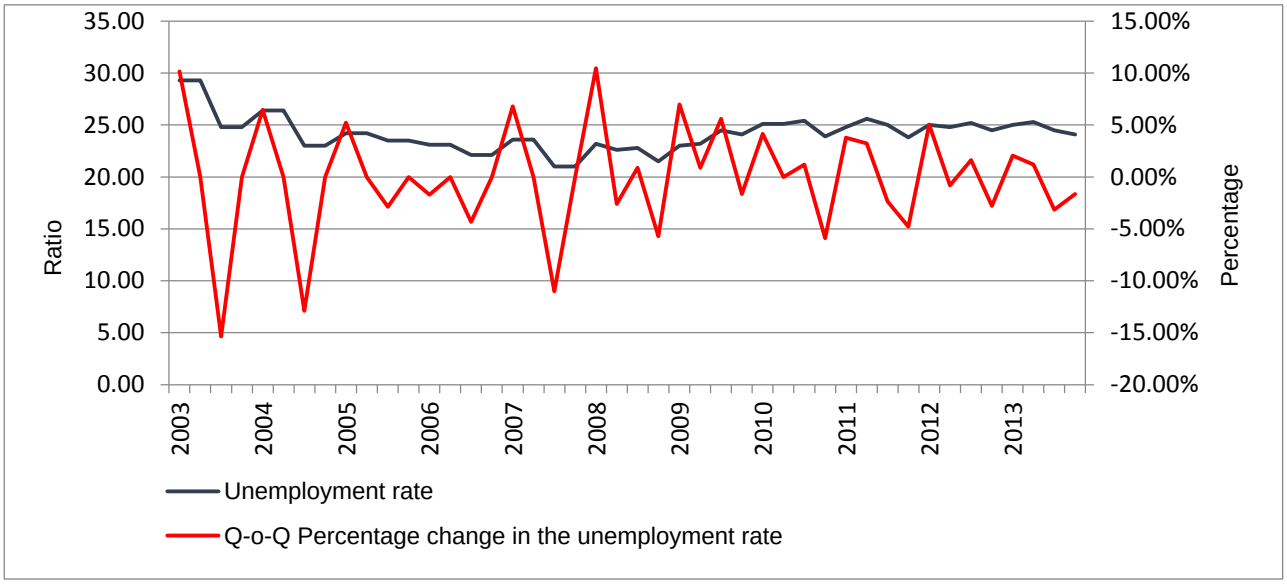
will generate a significant amount of renewable hydropower to help meet the growing demand for electricity in SA" (SAinfo reporter, 2010:1).

Much pressure was put on the entire economy regarding investment in power generating facilities. According to Laubscher (2010b:1), more emphasis should be placed on improving the ability of SA's industry in the global supply chains in order to overcome the disadvantage of long distances. Therefore super-efficient transport and logistics systems should be in place to overcome these disadvantages. The capacity constraint in SA boosts imports even more, which places the current account deficit in the balance of payments under severe pressure. A more buoyant and diverse economy would lead to profitable international business activities.

3.6.2 Unemployment trends in South Africa

The national unemployment rate is published on a quarterly basis by StatsSA as part of the QLFS. However, since 2000 to 2007, the labour force survey (LFS) has supplied bi-annual data on the labour market. The LFS revised this labour market information in 2005, due to changes in the data collection procedure, their methodology and the time periods of data releases. These changes resulted in the publication of the QLFS, which has been released since 2008 (IMF, 2014:1). In this study, the unemployment rate will be assembled by linking both the LFS and the QLFS on a quarterly basis by applying the strict (official) definition of unemployment. Persons between the ages of fifteen to sixty-five are used in the survey to determine the number of unemployed persons in SA.

Figure 3.6: The unemployment rate from 2003 to 2013



Source: Stats SA (2014b), author's calculations.

Figure 3.6 indicates a stagnation in the unemployment rate from 2003 until 2013, although during mid-2003 the lowest quarter-on-quarter rate of change was recorded reaching a high at the beginning of 2008. The official unemployment rate was at its highest rate during this period at 29.3% in the first quarter of 2003; where after it declined by 15.4% to 24.8% in the third quarter of 2003. In the second quarter of 2004, the unemployment rate once again fell dramatically by 12.8% to a rate of 23%. The reduction in the unemployment rate was as a result of the increased employment consisting of almost 40 000 jobs in the second quarter of 2004. A quarter-on-quarter increase of 6.8% was recorded in the first quarter of 2007, which caused the unemployment rate to increase to 23.6%. However, in the third quarter of 2007, the unemployment rate was reduced by 11% as compared to the first quarter of 2007 to 21%. The highest quarter-on-quarter percentage increase of 10.5% was recorded in the first quarter of 2008, increasing the unemployment rate to 23.2% from 21% in the fourth quarter of 2007. During the recession in 2008/2009, the government attempted to alleviate some socio-economic problems by enforcing an expansionary fiscal policy, building infrastructure, schools, and roads in an attempt to create more job opportunities, thus reducing the country's unemployment rate. During the fourth quarter of 2010, the unemployment rate was reduced by 5.9% from 25.4% in the third quarter of 2010 to 23.9%. Although the unemployment rate started to surge once again in the first

quarter of 2012, an annualised decline of 1.6% was recorded in the fourth quarter of 2013 to 24.1%.

3.7 SUMMARY

In this chapter, each of the variables in the macroeconomic transmission channel were discussed in the South African economy. Each of these variables, which include the real effective exchange rate, merchandise imports and exports, the consumer price index, nominal GDP and the unemployment rate, were greatly affected during the global financial crisis. Therefore, currency stability is needed given SA's high reliability on exports and imports, which could result in improving international trade and competitiveness. This improvement would contribute to more sustainable growth and hence a lower unemployment rate. Although by curbing consumer spending reduces the rate of inflation, a lower inflation rate in cooperation with a stable currency may encourage long-term economic growth, which will in turn reduce the unemployment rate when paired with the correct macroeconomic policy.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

In this chapter, the method used to conduct the research is explained. This chapter starts off by explaining the research approach used, briefly clarifying its characteristics, describing the strategy of inquiry, as well as classifying the overall research design. The sampling and a complete data analysis are described and explained by way of the macroeconomic transmission channel. The vector autoregressive (VAR) model is then described, the different types, its advantages and disadvantages and the main uses. The vector error correction model (VECM) is explained, which is mainly a restricted VAR for nonstationary series that has been found to be cointegrated. Subsequently, different types of tests will be explained to assess and demonstrate the quality and robustness of the study, as well as the ethics of this study.

4.2 RESEARCH APPROACH

There are two basic research methods distinguished by Brendt and Petzer (2011:31), namely, qualitative and quantitative. Qualitative research does not involve the analysis of statistics, while in quantitative research, data is gathered and statistical analysis conducted. According to Struwig and Stead (2007:4), quantitative research represents fairly structured data collection procedures involving a large representative sample, with the primary role of testing a hypothesis involving analysis of a possible relationship between two or more variables. However, Malhotra (2010:171) and Welman *et al*. (2005:9) argue that in qualitative research, data is collected using a more holistic approach, for example, using documents, photos, interviews and observations, which uses a small number of non-representative cases.

For this study, a quantitative research approach was chosen to statistically analyse the impact of the exchange rate on the unemployment rate in SA by using secondary data from SARB and Stats SA.

4.2.1 The basic characteristics of quantitative research

According to Struwig and Stead (2007:4), there are several characteristic of quantitative research, which include:

- *Constructs and their measurements*: Variables (constructs), which are based on the hypotheses in the theoretical framework, are examined and derived. In quantitative research, these variables are the central focus and therefore must be specifically measured;
- *Causality*: The cause and effect of the relationship between the dependant and independent variable are established by quantitative researchers, thereby explaining the reasons why things are the way they are and the cause thereof;
- *Generalisation*: Results are generalised beyond the research sample, therefore findings must legitimately be generalised to a wider population to imitate the methods and style of the researcher; and
- *Replication*: This determines to what extent other studies are applicable to findings, as well as checking the prejudices of the researcher. The clarity and accuracy in the research process ensures that the study is replicable and enables other researchers to repeat the study.

4.3 DESCRIPTION OF INQUIRY STRATEGY AND BROAD RESEARCH DESIGN

The analysis of the impact of the exchange rate on the unemployment rate in South Africa was conducted using time series data employing a macroeconomic transmission channel.

4.3.1 A description of the strategy of inquiry

This study aims to determine if there is any significant relationship between the exchange rate and the unemployment rate in SA. This relationship will be tested by using secondary data obtained from SARB and Stats SA. The statistical modelling of secondary data is therefore the strategy of inquiry. According to Mouton (2001:163), statistical modelling is designed to develop and validate models of the real world. The model conceptualises very specific theoretical assumptions of the real world, therefore being more deductive in nature. The main advantage of this inquiry strategy is the ability to simplify relationships and to model large scale phenomena; however, the model is limited to allow complete specification of a model due to the complexity and quality of the data, as well as the complexity of the phenomena (Mouton, 2001:164).

4.3.2 A classification of the overall research design

The core research characteristics describing the broad research design of the proposed study are:

- *Empirical*: The study is considered to be empirical research, which is the method in which empirical observations or data can be observed and measured by using a methodology to answer the research question (Moody, 2002:1). Therefore, in this study, secondary data are re-analysed to determine the relationship between the exchange rate and the unemployment rate in SA;
- *Basic:* The study may be categorised as basic research as the research is undertaken purely to understand the relationship between the exchange rate and the unemployment rate in SA. According to Saunders *et al*. (2009:9), the main purposes of basic research is to "*expand the knowledge of processes*", "*results in universal principles relating to the process and its relationship to outcomes*" and "*findings of significance and value to society in general";*
- *Explanatory:* The study aimed to establish the fundamental relationship between the exchange rate and the unemployment rate following a macroeconomic transmission channel that will be explained in the next section;
- *Longitudinal:* The study will contain longitudinal data by using quarterly time series data of SA over a time period of 2003/Q1 to 2013/Q4. According to Saunders *et al*. (2009:155), longitudinal studies "*study change and development*" in which data are collected for a specific variable in various points in time;
- *Quasi-experimental:* The study will not be able to control all confounding variables and therefore some alternative variables might influence the exchange rate-unemployment relationship and therefore might lead to biased results. Struwig and Stead (2007:10) describe the quasi-experimental research design as one where participants (variables) are not randomly assigned and where confounding variables cannot be controlled;
- *Secondary data:* In this study large-scale datasets will be used from Stats SA and SARB. Data will be re-analysed, which have been collected for other purposes, to meet the primary objective of this study (Saunders *et al.*, 2009:256); and
- *Quantitative data:* The study will only use variables that are of numerical nature in order to analyse the relationship between the exchange rate and the rate of unemployment.

4.4 SAMPLING

This study aimed to examine the impact of the exchange rate on the unemployment rate in SA for the time period 2003/Q1 to 2013/Q4. This specific timeframe was chosen due to limited availability of reliable data on specifically the unemployment rate.

4.5 THE DATA

Quarterly time series data from secondary sources from 2003 to 2013 was used from the SARB and Stats SA online database; both reliable and independent government institutions. In this section, each of the variables included in the empirical model are discussed in brief, the detailed discussion of each variable is provided in the preceding chapters.

4.5.1 Real effective exchange rate

The effective (multilateral) exchange rate measures the overall movement of the rand against major currencies (Mohr, 2005:150; Takaendesa, 2006:13). According to SARB (2014d:1), the weighted average of four major banks are used to determine the exchange rate between the South African rand and other currencies. The bank's weights are based on various shares for foreign exchange in the domestic market. In this study, the real exchange rate was employed for analysis, which can be defined as the nominal exchange rate adjusted for inflation. According to the international monetary fund (IMF, 2014:1), the real effective exchange rate reflects the average trade in manufactured goods between fifteen trading partners, which is constructed into an index. The monthly data on the real effective exchange rate information was obtained from SARB and transformed into quarterly averages since the first quarter of 2003 to the fourth quarter of 2013. The real exchange rate (RER) was calculated by using the following formula:

$$(4.1) \quad Q = \frac{E \times P*}{P}$$

Where Q reflects the RER and E the nominal exchange rate, which are then multiplied with the foreign price ratio $P*$ to the local price P. The exchange rate is stated in units of domestic currencies per unit of foreign currencies. As E increases, so will Q, which implies that the nominal and real exchange rate will appreciate simultaneously.

4.5.2 Merchandise imports and exports

According to the IMF (2014:1), South African data regarding the BOP are sourced from the Declaration (SAD 500), which is then submitted by importers and exporters. After data are firstly released in SARB publications, the data are revised during the next month when more accurate data is available.

In general, imports consists of "*commodities of foreign origin as well as goods of domestic origin returned to South Africa with no change in condition or after having been processed and/or assembled in other countries*", whereas "*exports measure the value of merchandise that physically leaves South Africa*" (IMF, 2014:1). Data is published quarterly by SARB that has to comply with the Custom Union of SA.

4.5.3 Consumer price index

According to the IMF (2014:1), the CPI of the total country reflects the average prices of all the items in the index. The weighted sum of prices is updated monthly, although the weights assigned to the prices of specific goods and services are updated every five years. Data on the CPI were obtained on a monthly basis from Stats SA from January 2003 to December 2013, which were then transformed into quarterly averages. Based on the results of the 2010/2011 income and expenditure survey (IES), Stats SA selected a new basket of goods and services in November 2012 (QES, 2013:37). A new base period was selected in January 2013 so that December 2012 equals 100 (IMF, 2014:1).

4.5.4 Gross domestic product

According to the IMF (2014:1), quarterly data on South Africa's GDP are sourced from Stats SA and external data providers, which are then published by SARB. Nominal GDP is expressed in millions of rands, which can also be referred to as GDP at market prices (Mohr *et al*., 2009:61). To determine the GDP at market prices, national accountants use the following calculation:

(4.2) $GDP\ at\ market\ prices = GDP\ at\ basic\ prices + taxes\ on\ products - subsidies\ on\ products$

By using the nominal GDP, the size of the economy during a specific period can be measured, however, the nominal GDP doesn't exclude changes in inflation.

4.5.5 Unemployment rate

The quarterly labour force survey (QLFS) is part of Stats SA in that Stats SA publishes the quarterly national unemployment rate. Although the QLFS has only been released since 2008, the labour force survey (LFS) has supplied bi-annual data from 2000 to 2007 (IMF, 2014:1). In this study, the unemployment rate was constructed by linking both the LFS and the QLFS on a quarterly basis and applying the strict (official) definition of unemployment, where the number of discouraged workforce is excluded. Persons between the ages of fifteen to sixty-five are used in the survey to determine the number of unemployed persons in SA of working age. According to Mohr (2000:88), the official unemployment rate is calculated by means of the following formula:

(4.3) *Unemployment strict definition = (Number of unemployed persons / Number of persons in total labour force) × 100*

Table 4.1 provides a summary of each of the variables used in this study, as well as indicating their units, source and time series code.

Table 4.1: Variables and sources

Variable	Description	Units	Source	Code
Real effective exchange rate (RER)	Real effective exchange rate of the rand: Average for the period - 15 trading partners - Trade in manufactured goods	Index	SARB	KBP5378M
Imports (BOPM)	Imports of goods and services at current prices	R' Million	SARB	KBP6014K
Exports (BOPX)	Exports of goods and services at current prices	R' Million	SARB	KBP6013K
CPI	Consumer Price Index (CPI):All the items - Total country (Dec2012=100)	Index	Stats SA	CPT00000
GDP	Gross domestic product (GDP) at market prices - Current prices	R' Million	SARB	KBP6006K
Unemployment rate (UNEM)	Unemployment rate	Ratio	Stats SA (QLFS)	n.a.

4.6 METHODOLOGY

The following section discusses the methodology involved in the vector autoregressive model (VAR) as an econometric approach. This approach was used to determine the relationship between the exchange rate and unemployment.

4.6.1 The vector autoregressive model

According to Stock and Watson (2001:1), a macroeconomic framework known as the vector autoregressive (VAR) model was first introduced in 1980 by Christopher Sims. This entails a combination of univariate time series models and the simultaneous equation model (Brooks, 2003:290). The VAR model can be generalised as a function in which the single-equation and single-variable in a linear model using its own lagged values can be used to explain the current value of a variable. Since the VAR model uses multiple time series, it can be described as a model of system regressions, which implies there is more than one dependant variable, providing rich dynamics in the systematic approach (Brooks, 2003:290; Stock & Watson. 2001:1). Stock and Watson (2001:1) find that this is a credible and coherent approach to describing data, forecasting, conducting structural inference as well as policy analysis.

For a set of n time series variables, consider a two-variable VAR with only two variables y_{1t} and y_{2t} where current values depend on the previous k values of both variables, and error terms on different combinations. A simple VAR model can be written as:

(4.4) $$y_{1_t} = \beta_{10} + \beta_{11} y_{1_{t-1}} + \alpha_{11} y_{2_{t-1}} + u_{1_t}$$

(4.5) $$y_{2t} = \beta_{20} + \beta_{21} y_{2_{t-1}} + \alpha_{21} y_{1_{t-1}} + u_{2_t}$$

where the white noise disturbance term (or error term) is u_{it} with

$$E(u_{it}) = 0, (i = 1,2), E(u_{1t} u_{2t}) = 0$$

In Matrix form, the VAR can be written as:

(4.6) $$\begin{bmatrix} 1 & \beta_{12} \\ \beta_{21} & 1 \end{bmatrix} \begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \end{bmatrix} + \begin{bmatrix} u_{y1t} \\ u_{y2t} \end{bmatrix}$$

The system can also be expanded to include g variables, $y_{1t}, y_{2t,}, y_{3t,}.., y_g$, where each of these have an equation similar to the above. The model can be extended further by using first difference terms and cointegration relationships, also known as the VECM, this will be explained in section 4.6.2.

4.6.1.1 Types of vector autoregressive models

According to Stock and Watson (2001:1), there are three different types of VAR models, these include the reduced form-, recursive-, and structural VAR. Each of these models will be explained; however, in this study a reduced VAR will be used.

I. 4.6.1.1.1 REDUCED FORM VECTOR AUTOREGRESSIVE MODEL

A reduced (standard) form VAR can be expressed in a linear function where each of the variables and their own past values are considered, as well as the uncorrelated error term (Stock & Watson. 2001:1). According to Brooks (2003:296), a reduced form VAR can be written as:

(4.7) $y_t = \beta_0 + \beta_1 y_{1t-1} + e_t$

The reduced VAR is a set of simultaneous equations which contain only predetermined values of variables whose values are known at time t on the right hand side (RHS), including no contemporaneous feedback terms (Kilian, 2011:2). Therefore, this VAR will use the ordinary least squares (OLS) or linear least squares as a method to estimate equation by equation (Stock & Watson. 2001:2). A reduced VAR is used when the formulation is not at odds with the theory with regard to the relationships between variables (Brooks, 2003:296).

II. 4.6.1.1.2 RECURSIVE VECTOR AUTOREGRESSIVE MODEL

Stock and Watson (2001:3) explain that in the recursive VAR structures, the error terms in each regression equation should be uncorrelated with the error in the previous equations by carefully including some contemporaneous values. To disentangle or "*orthogonalise*" the structural innovations with the error e_t from the reduced form innovations y_t, the Cholesky decomposition of the variance-covariance matrix can be used, which computes the square root of a scalar variance (Kilian, 2011:3).

III. 4.6.1.1.3 STRUCTURAL VECTOR AUTOREGRESSIVE MODEL

In the structural VAR, economic theory is used to sort out the contemporaneous links between variables. The specific casual links between different variables are indicated to allow correlations to be interpreted (Stock & Watson. 2001:4). According to Brooks (2003:296), a structural VAR can be written as:

(4.8) $y_{1t} = \beta_{10} + \beta_{11} y_{1t-1} + \alpha_{11} y_{2t-1} + \alpha_{12} y_{2t-1} + u_{1t}$

(4.9) $y_{2t} = \beta_{20} + \beta_{21} y_{2t-1} + \alpha_{21} y_{1t-1} + \alpha_{22} y_{1t-1} + u_{2t}$

Since identical pre-determined (lagged) variables appear on the RHS, the structural VAR is not identified, therefore a restriction exists that one of the coefficients on the contemporaneous term must be imposed as zero. To estimate the validity of the triangular set of VAR equations, either α_{12} or α_{22} must be set to zero (Reale & Wilson, 2001:57). Choosing which two restrictions to use is mainly determined by the theory imposed.

4.6.1.2 Advantages and Disadvantages of vector autoregressive modelling

According to Stock and Watson (2001:11-17) and Brooks (2003:291-292), the following can be described as pros and cons of the VAR model:

IV. 4.6.1.2.1 ADVANTAGES OF THE VECTOR AUTOREGRESSIVE MODEL

The advantages of the VAR model are as follows (Brooks, 2003:291-292; Stock & Watson, 2001:11-17):

- All variables are endogenous providing discretion concerning the classification of variables, thus making the model more flexible;
- VAR depends on more than just its own lags or combination of white noise terms;
- It's a simpler model since each OLS estimation of each equation is given separately;
- The model is an improvement on traditional structural models, since it generates forecasts better;
- Multiple time series are involved, which implies that there is more than one dependant variable, providing rich dynamics in the systematic approach; and

- This is a credible and coherent approach to describe data, forecasting, structural inference, as well as policy analysis.

V. 4.6.1.2.2 DISADVANTAGES OF THE VECTOR AUTOREGRESSIVE MODEL

The disadvantages of the VAR model are as follows (Brooks, 2003:291-292; Stock & Watson, 2001:11-17):

- The model is less responsive to the theoretical analysis, hence policy prescriptions;
- Data interpretation on the VAR coefficient estimates are often unclear;
- The appropriate lag length might be vague, however this will be explained later in this chapter;
- Too many parameters need to be estimated if there are g equations, however if the sample size is too small, the degrees of freedom will diminish, and confidence intervals will be impacted; and
- Questions regarding the stationarity of variables arise, although the VAR approach recommends that differencing to induce stationarity is not advisable since it throws away information between variables that is crucial in determining long term relationships.

4.6.1.3 The main uses of a vector autoregressive model

VI. 4.6.1.3.1 IMPULSE RESPONSE FUNCTION

Stock and Watson (2001:7) clarify that the impulse response function traces out the responsiveness of the current and future values of each of the dependant variables by shocking each of the variables. Unit shocks for each of the variables in each separate equation are applied to the error, observing the effects over time in the VAR system (Eviews 3.1 User's Guide, 1999:483). Therefore, if there are g variables in the system, g^2 impulse responses can be generated. If the system is stable, the shock will gradually deteriorate. Consider the following example on how the impulse response function operates (Brooks, 2003:299-230):

(4.10) $y_t = \beta_1 y_{t-1} + u_t$

where $\beta_1 = \begin{bmatrix} 0.5 & 0.3 \\ 0.0 & 0.2 \end{bmatrix}$

The VAR can also be written out using the elements of the matrices and vectors as:

(4.11) $\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} 0.5 & 0.3 \\ 0.0 & 0.2 \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix}$

Consider the effect at time $t = 0, 1, \ldots,$ of a unit shock to y_{1t} at time $t = 0$

(4.12) $y_0 = \begin{bmatrix} u_{10} \\ u_{20} \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

(4.13) $y_1 = \beta_1 y_0 = \begin{bmatrix} 0.5 & 0.3 \\ 0.0 & 0.2 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix} + \begin{bmatrix} 0.5 \\ 0 \end{bmatrix}$

(4.14) $y_2 = \beta_1 y_1 = \begin{bmatrix} 0.5 & 0.3 \\ 0.0 & 0.2 \end{bmatrix} \begin{bmatrix} 0.5 \\ 0 \end{bmatrix} + \begin{bmatrix} 0.25 \\ 0 \end{bmatrix}$

The effect on y_{2t} is always zero, since the variable y_{1t-1} has a zero coefficient attached to it in the equation for y_{2t}.The following, however, considers the effect of a unit shock to y_{2t} at time $t = 0$:

(4.15) $y_0 = \begin{bmatrix} u_{10} \\ u_{20} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

(4.16) $y_1 = \beta_1 y_0 = \begin{bmatrix} 0.5 & 0.3 \\ 0.0 & 0.2 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \end{bmatrix} + \begin{bmatrix} 0.3 \\ 0.2 \end{bmatrix}$

(4.17) $y_2 = \beta_1 y_1 = \begin{bmatrix} 0.5 & 0.3 \\ 0.0 & 0.2 \end{bmatrix} \begin{bmatrix} 0.3 \\ 0.2 \end{bmatrix} + \begin{bmatrix} 0.21 \\ 0.04 \end{bmatrix}$

The same principle applies to a VAR containing more equations or more lags. According to Stock and Watson (2001:7), persistent common variations can be estimated using the impulse response function.

VII. 4.6.1.3.2 VARIANCE DECOMPOSITION

Brooks (2003:300) explicates that variance decomposition provides "*the proportion of movements in the dependent variable that are due to their own shock, versus the shocks to other variables*". In other words, variations are decomposed into component shocks to shock the endogenous variables in the VAR (Eviews 3.1 User's Guide, 1999:484). Therefore a shock in variable y_1 will be transmitted to all the other variables in the VAR system. Variance decompositions regulate how much of the s-step-ahead forecast error variance of a given variable is explained by innovations to each explanatory variable for s = 1, 2, . . . Most of the (forecast) error variance of the series in practice usually explains the observed series shocks in a VAR.

VIII. 4.6.1.3.3 GRANGER CAUSALITY TEST

According to Brooks (2003:297), if a VAR includes too many lagged variables, the difficulty of finding significant effects on dependant variables surges. As a result, the Granger causality test is done to restrict all the lags of a particular variable to zero to examine whether the lagged values of one variable support the prediction of another (Stock & Watson, 2001:6). The causality tests seek to answer questions such as, do changes in y_1 cause changes in y_2? Therefore the Granger-causality test examines the correlation between the current value of one variable and the past values of other variables. In other words, it determines which variables have significant impact on the future values of each variable in the system.

An F-test approach tests multiple hypotheses, also termed as restricted least squares, where the residual sums of squares are compared in the test statistic. The F-test statistic for testing multiple hypotheses can be calculated in the following way (Brooks, 2003:93):

(4.18) $$test \quad statistic = \frac{RRSS - URSS}{URSS} \times \frac{T-k}{m}$$

where the following representation applies:

$URSS$ = residual sum of squares from unrestricted regression

$RRSS$ = residual sum of squares from restricted regression

m = number of restrictions

T = number of observations

k = number of regressors in unrestricted regression

The test centres on the residual sums of squares by comparing the restricted and unrestricted regressions. If the residual sum of squares result is not much higher than the unconstrained models residual sum of squares, after imposing constraints on the model, it would be concluded that the restrictions were supported by the data. However, if the residual sum of squares increased considerably after these restrictions, these restrictions were not supported by the data, hence the hypothesis should be rejected.

In the F-test under a null hypothesis, the F-distribution has two degrees of freedom parameters where the value of these parameters are illustrated by m the number of restrictions imposed on the model, and $T-k$, the number of observations less the number of regressors for the unrestricted regression respectively (Brooks, 2003:96).

4.6.2 Vector error correction and cointegration theory

Non-stationary variables are considered to be cointegrated when, after first-difference, their linear relationship is found to be stationary. Most time series data are not stationary, differencing variables has been the preferred approach to deal with this problem, however, this throws away long term information (Chicheke, 2009:78).

As a result, the new generation models emerged, which are established on cointegration and error correction modelling or VECM. The number of cointegrating vectors must first be identified by using the Johansen technique, which is considered to be the most popular and powerful technique. After the identification of the number of cointegrating vectors, the VECM can be assessed by the specified number of cointegrating vectors, the trend assumption and normalising the model on the true cointegrating relations.

According to Nyahokwe (2013:112), the VECM is basically a restricted VAR intended for non-stationary series that have been found to be cointegrated, which are both easy to

understand and to interpret. While allowing for short run adjustment dynamics, the long term behaviour of endogenous variables in the VECM is restricted to converge with their cointegrating relationships (Chicheke, 2009:79). Some of the disadvantages of this model include uncertainty regarding the arrangement of variables and settling the possibility of there being more than two variables and errors which can be carried forward. The VECM relies on the two step estimator by firstly estimating the generated residual series, and secondly the regression. In the case where more than two variables exist in the model, it may lead to the possibility of having more than one cointegrated vector. In order to solve this problem, the Johansen technique can be used after transforming the VAR into the VECM, considering the following example provided by Brooks (2003:350). The following VAR, with a set of g variables $(g \geq 2)$ under consideration that $I(1)$ with k lags, can be illustrated as:

(4.19) $y_t = \beta_1 y_{t-1} + \beta_2 y_{t-2} + \cdots + \beta_K y_{t-K} + u_t$

The above VAR can be transformed as a VECM in the following way:

(4.20) $y_t = \prod y_{t-K} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \cdots + \Gamma_{k-1} \Delta y_{t-(k-1)} + u_t$

where $\prod = (\sum_{i=1}^{k} \beta i) - I_g$ and $\Gamma = (\sum_{j=1}^{i} \beta j) - I_g$

Containing g variables in the first difference form on the LHS, with $k-1$ lags of the dependant variables, each with a Γ coefficient matrix attached to it. $\prod$ is considered as the long run coefficient matrix, which determines the number of cointegrating relationships (Chicheke, 2009:80). The Johansen test focuses on the $\prod$ matrix, which will be discussed in section 4.6.3.6. After determining the number of cointegrating vectors by the use of the Johansen test, the VECM can be estimated according to Chicheke (2009:80) by specifying the number of cointegrated vectors, trend assumptions and normalising the model to the true cointegrated relations.

4.6.3 Assessing and demonstrating the quality and rigour

In this section, different types of tests will be explained which were used to assess and demonstrate the quality and robustness of the study.

4.6.3.1. Augmented Dickey Fuller test for unit roots test

According to Brooks (2003:327) and Gujarati (1999:459), most financial and economic time series data are considered to only contain a single unit root, making it non-stationary. Series are considered to be stationary when they are said to be integrated of order zero ($I(0)$) and non-stationary if they contain a unit root ($I(1)$) (Chicheke, 2009:77). The number of unit roots is estimated to determine how many times the data should be differenced to become stationary. For example, $I(1)$ contains only one unit root, therefore it can only be differenced once to induce stationarity. Consider the following $I(2)$ series equation:

(4.21) $y_t - 2y_{t-1} + y_{t-2} = u_t$

(4.22) $(1-2L+L^2)y_t = u_t$

(4.23) $(1-L)(1-L)y_t = u_t$

In this equation, it can be seen that in y_t there are two unit roots. According to Dickey and Fuller (1979:74:427-431), in testing the unit root, the autocorrelation function (acf) would be examined by the process of the acf for a unit root (a random walk) which will decay slowly to zero. In 1976, Dickey and Fuller did pioneering work in time series by testing for a unit root, with their main objective being to test the null hypothesis that $\phi = 1$ in

(4.24) $y_t = \phi y_{t-1} + u_t$

against the one-sided alternative $\phi < 1$. The hypothesis of interest is H_0 which tests if series contain a unit root versus H_1, which implies that the series are stationary (Gujarati, 2002:816; Song & Wu, 1998:187). To ease computation and interpretation, the following regression is employed in practice:

(4.25) $\Delta y_t = \psi y_{t-1} + u_t$

Since $\phi - 1 = \psi$, the test of $\phi = 1$ is comparable to a test of $\psi = 1$. In the regression test, the Dickey–Fuller (DF) test (also called a t-test) can be conducted to allow for an intercept, or

an intercept and a deterministic trend, or neither. In each case, the model for the unit root test is

(4.26) $y_t = \phi y_{t-1} + u + \lambda t + u_t$

By subtracting y_{t-1} from each side of the equation the test can also be written as

(4.27) $\Delta y_t = \psi y_{t-1} + u + \lambda t + u_t$

Where y_t is the required time series, Δ as the difference operator, t as the time trend and u_t as the pure white noise error term (Chicheke, 2009:78). The test statistic for the original DF tests can be defined as

(4.28) $test \quad statistic = \dfrac{\hat{\psi}}{S\hat{E}(\hat{\psi})}$

The test statistic follows a non-standard distribution and not the usual t-distribution under the null hypothesis, which implicates non-stationarity (Brooks, 2003:329). The problem with the DF test is that autocorrelation is not taken into account in the dependant variables and in the error process or term u_t (Chicheke, 2009:78). To eliminate this problem, the Augmented Dickey-Fuller (ADF) test can be conducted by using p lags of the dependant variable, which can be written as

(4.29) $\Delta y_t = \psi y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + u_t$

Extra lags are included off Δy_t in the dependant variable to ensure that u_t is not autocorrelated, and are now used to absorb the dynamic structure present. Because most time series data is not stationary, differencing it was the preferred approach but this throws away long run information in a VAR. In order to deal with this problem, the VECM based on long-run cointegration was developed (Brooks, 2003:400).

4.6.3.2 Heteroscedasticity test (residual diagnostics tests)

According to Brooks (2003:386), heteroscedasticity exists when the variance of the errors in an estimation is not constant or does not have identical variances, however, when these errors are constant it is known to be homoscedasticity (Gujarati, 2003:399). To detect heteroscedasticity, White's test can be used as it checks if there is any systematic relationship between the squared residuals and the explanatory variables (Mukherjee *et al*., 1998:261; White, 1980:817-838). It, however, assumes that the regression model is of a standard linear form which can be written as

(4.30) $y_t = \beta_1 + \beta_2 y_{2t} + \beta_3 y_{3t} + u_t$

To estimate the model, heteroscedasticity $\text{var}(u_t) = \sigma^2$ must be tested by obtaining the residuals $\hat{u}_t$ from the auxiliary regression

(4.31) $y_t = \alpha_1 + \alpha_2 y_{2t} + \alpha_3 y_{3t} + \alpha_4 y_{2t}^2 + \alpha_5 y_{3t}^2 + \alpha_6 y_{2t} y_{3t} + v_t$

Independent from u_t is the normally distributed disturbance term v_t. Two approaches can be followed to test the auxiliary regression: the F-test (explained in section 4.6.1.3.3) and the Lagrange multiplier (LM) test, which focuses on the R^2. The value of the R^2 will be high if one or more of the coefficients in equation (4.31) are statistically significant and vice versa. The LM test can therefore be calculated by multiplying the R^2 obtained from the auxiliary regression with the number of observations T where m displays the number of regressors (excluding the constant term)

(4.32) $TR^2 \sim y^2(m)$

If, however, y^2 of the statistical test is greater than the corresponding critical value from the statistical table, then errors are considered to show significant evidence of heteroscedasticity.

Heteroscedasticity is dealt with by using the generalised least squares (GLS) method by relating the error variance to z^2

(4.33) $\text{var}(u_t) = \sigma^2 z_t^2$

To remove heteroscedasticity, the regression must be divided through z^2, where $v_t = \frac{u_t}{z_t}$ is an error term.

(4.34) $\frac{y_t}{z_t} = \beta_1 \frac{1}{z_t} + \beta_2 \frac{x_{2t}}{z_t} + \beta_3 \frac{x_{3t}}{z_t} + v_t$

If $\text{var}(u_t) = \sigma^2 z_t^2$, then $\text{var}(v_t) = \text{var}\left(\frac{u_t}{z_t}\right) = \frac{\text{var}(u_t)}{z_t^2} = \frac{\sigma^2 z^2}{z_t^2} = \sigma^2$ for known z^2

Since β_1 is multiplied by $\frac{1}{z_t}$, the latter regression does not include a constant, therefore making disturbances in equation (4.34) homoscedastic (White, 1980:817-838). The GLS is also known as the weighted least squares (WLS) since the weighted sum of the squared residuals are minimized (Brooks, 2003:136).

4.6.3.3 Auto correlation test

According to Gujarati (2003:454), the relation between series of observations in time can be regarded as autocorrelation. Chicheke (2009:82) explains that autocorrelation occurs when errors are correlated with one another across time and can be tested with the estimated residuals $\hat{u}$ by investigating the relationship between current $\hat{u}, \hat{u}_t,$ and previous values $\hat{u}_{t-1}, \hat{u}_{t-2}, \ldots$ To test for autocorrelation, the more generalised test, according to Brooks (2003:148), is the Breusch--Godfrey test, which can be written as

(4.35) $u_t = p_1 u_{t-1} + p_2 u_{t-2} + p_3 u_{t-3} + \cdots + p_r u_{t-r} + v_t \qquad v_t \sim N(0, \sigma_v^2)$

The errors of time $t-1$ are independent from one another. Note that $(T-r)$ pre-multiplies R^2 in the test of autocorrelation rather than the T used to test heteroscedasticity. This is because the first r would be lost in order to obtain the r lags in the test regression, leaving

$(T-r)$ to estimate the auxiliary regression. If there is no autocorrelation, the value of the test statistic will exceed the critical value of the Chi-squared statistical tables.

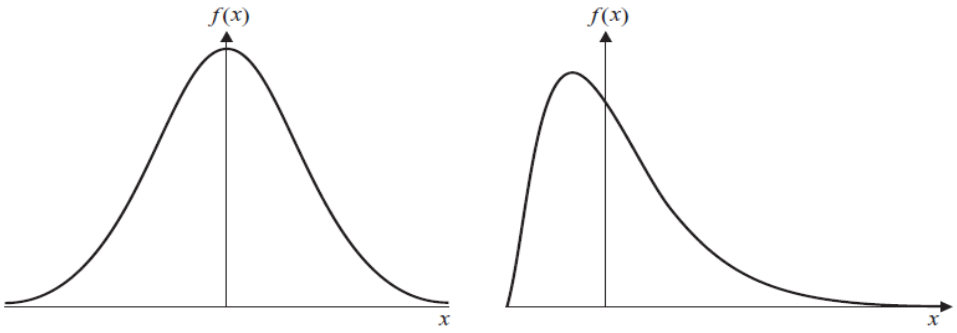
The Breusch--Godfrey test includes a wider variety of circumstances, however, the appropriate value of r and the number of lags of the residuals are difficult to determine when computing the test (Brooks, 2003:148-149). If the existence of autocorrelation is ignored, the standard errors estimates would be wrong, leading to false interpretations regarding the variable variations by rejecting the null hypothesis, even if it is correct, by increasing the type I error. Approaches which can be used to deal with autocorrelation is the GLS procedure that was explained previously.

4.6.3.4 Normality test

According to Chicheke (2009:83), the test for normality $u_t \sim N(0,\sigma_v^2)$, in other words, residuals which are normally distributed with a zero mean and a constant variance should be met as one of the assumptions of the classical linear regression model (CLRM) otherwise results in the t- and F- statistics would be invalid.

To detect misspecification problems, variables are firstly characterised by the first two moments in looking at their mean and variance through observing residuals where checks in the skewness and kurtosis are determined in the third and fourth moments of the distribution. The Jarque-Bera (JB) test is most commonly used to test for normality by comparing the third and fourth moments of the residuals to the normally distributed residuals.

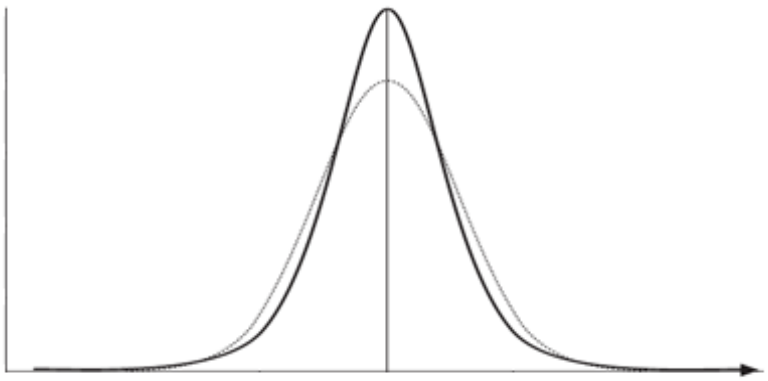
Figure 4.1: Normal versus a skewed distribution



Source: Brooks (2003).

Skewness measures the mean values in which its distribution is not symmetrical. In a normal distribution, it is called mesokurtic since its distribution is symmetric about its mean, as seen in Figure 4.1.

Figure 4.2: A leptokurtic versus a normal distribution



Source: Brooks (2003).

Kurtosis measures how fat the tails of the distribution are, and is considered to be 3 so its coefficient of excess kurtosis is zero in a normal distribution. Financial and economic time series data are mostly characterised to have a leptokurtic distribution, since it has the same mean and variance as a normally distributed variable, but it has a fatter tail and is more peaked at the mean (see Figure 4.2).

According to Brooks (2003:162), Jarque and Bera denoted the errors by u and their variances by σ^2 to test the coefficient of skewness b_1 and the coefficient of kurtosis b_2, which are expressed respectively

(4.36) $b_1 = \frac{E[u^3]}{(\sigma^2)^{2/3}}$ and $b_2 = \frac{E[u^4]}{(\sigma^2)^2}$

A normal distribution has a kurtosis of 3, so the excess kurtosis $b_2 - 3$ is therefore zero. Therefore the Jarque-Bera test can be written as

(4.37) $W = T\left\{\frac{b_1^2}{6} + \frac{(b_2 - 3)^2}{24}\right\}$

b_1 and b_2 can be estimated by using the residuals from the ordinary least squares (OLS) regression, where T illustrates the sample size. If the p -value for the JB test is zero, the residuals are negatively skewed, hence the hypothesis of normality is rejected. If non-normality is found, the OLS estimation method can be used.

4.6.3.5 Choosing the lag order of a vector autoregressive model

The optimal lag length is important because including only too few will not remove all of the autocorrelation, however, including too many will eliminate the degrees of freedom due to the increased number of parameters. According to Brooks (2003:293), there are two methods to determine the optimal lag length namely, cross-equation restrictions and information criteria. The multivariate versions of the information criteria for the VAR lag length selection are mostly recommended by Brooks (2003:294). These can be defined as

(4.38) $MAIC = \log\left|\hat{\Sigma}\right| + 2k'/T$

(4.39) $MSBIC = \log\left|\hat{\Sigma}\right| + \frac{k'}{T}\log(T)$

(4.40) $MHQIC = \log\left|\hat{\Sigma}\right| + \frac{2k'}{T}\log(\log(T))$

The variance-covariance matrix of residuals is illustrated by $\hat{\Sigma}$, with the number of observations as T and the total number of regressors in all the equations as k', which are all equal to $p^2k + p$ in the VAR system. For p being the number of equations each with k

lags together with a constant term in each equation. The chosen number of lags constructed for $0, 1, ...k$ lags is the value of the number, minimising the given information criterion.

Structural models are multivariate in nature in which movements in current or past values of the explanatory (other) variables are used to explain changes in a variable (Brooks, 2003:206). Although the multivariate information criteria may produce conflicting VAR order selections, it comprises the sequential modified likelihood ratio (LR), the Akaike information criterion (AIC), the final prediction error (FPE), the Schwarz information criterion (SC), and the Hannan-Quinn information criterion (HQ). Therefore, knowledge of economic theory and the information criteria approach will be used in this study to avoid these conflicting selections, as well as to account for possible multicollinearity. Multicollinearity occurs when the explanatory variables are highly correlated with one another. Firstly, if ignored, it may make the regression look good but individual variables will not be significant due to a high R^2(or goodness of fit). Secondly, in the case of multicollinearity, the small changes in the specification of an explanatory variable will make the regression very sensitive. Thirdly, inappropriate assumptions could be drawn due to very wide confidence intervals for the parameters, making it difficult to draw conclusions when multicollinearity is present (Brooks, 2003:172).

According to economic theory little is known on the appropriate lag length of a VAR, therefore the Akaike or the Schwartz criterion can be used to determine the number of lags by considering the model that gives the lowest values. Including too few lags may lead to specification errors. The lag length optimality also plays an important part in the VECM since it can affect the Johansen cointegration test, therefore the number and form produced by the chosen lag length should conform to economic theory (Brooks, 2003:294).

4.6.3.6 Johansen's cointegration test

According to Harris (1995:80), the Johansen technique involves time series data to estimate the model. It not only captures the underlying properties of time series data, but also estimates all the cointegrating relationships between variables that are non-stationary.

Before the Johansen cointegration test can be done, the VAR needs to be turned into a VECM, as seen in equation (4.20).

In order to avoid a spurious regression, firstly the stationary cointegrating relationships between non-stationary variables must be detected. The Johansen test can only be done when all the variables are integrated; however, this is not always the case since it may greatly affect the results (Asteriou & Hall, 2007:322). Secondly, the lag length optimality in the VECM can greatly affect the Johansen test as it is very important to have a Gaussian error term, which is a normal standard error term, and that it does not suffer from non-stationarity, autocorrelation and heteroscedasticity (Chicheke, 2009:80). Thirdly, a decision should be made to determine which dynamic model to employ; this may include either in the short run, the long run or both as these can be done by making use of the Puntula principal. The Puntula principal presents and estimates the results of models from the most restrictive to the least restrictive hypothesis. According to Asteriou and Hall (2007:324), the results of the model will move from the most to least restrictive model until the null hypothesis of no cointegration is not rejected, where at each stage the trace test statistic is compared to its critical value. Lastly, the Johansen test focuses on the Π matrix, therefore the rank or the number of cointegrating vectors should be determined (Harris, 1995:80). Two methods can be used to achieve this, namely the maximum eigenvalue $\lambda_{\max}$ and the trace λ_{trace} which can be formulated as:

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

and

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

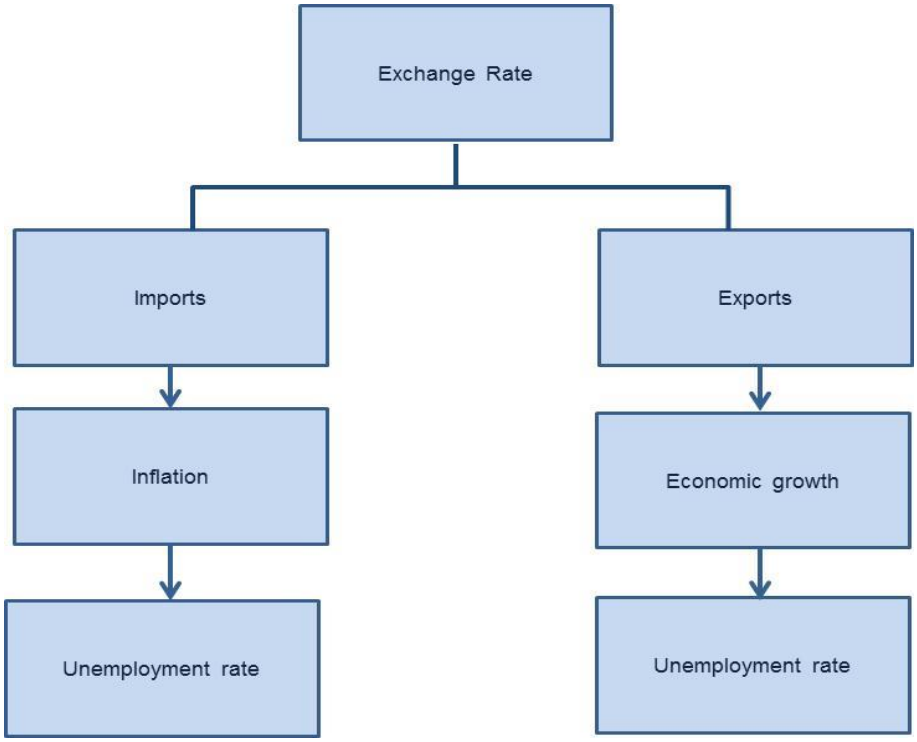
From the Π matrix, r is the number of cointegrating vectors and $\hat{\lambda}_i$ is the estimated value of the i^{th} ordered eigenvalue from the matrix under the null hypothesis. However, $LN(1-\hat{\lambda}_i)$ will become larger and more negative as $\hat{\lambda}_i$ becomes larger, hence a larger test statistic. Therefore, a cointegrating vector exists when the eigenvalue has a significant non-zero value (Chicheke, 2009:81).

The cointegration test between the y s is calculated by the matrix, whereas the $\prod$ is equal to the number of its characteristic roots (eigenvalues) that are different from zero. These denoted eigenvalues λ_i must be less than one in absolute value and be positive. If $(\prod) = 1$, then $LN(1-\lambda_1)$ will be negative and $LN(1-\lambda_i) = 0 \forall i > 1$. Therefore, the largest eigenvalue λ_1 must significantly be non-zero, while others are not significantly different form zero for $\prod$ to have a rank of one. The distribution of the test statistic is non-standard, and the critical values depend on the number of non-stationarity components $g-r$ and whether constants are included in each of the equations (Brooks, 2003:351).

4.7 THEORETICAL MODELLING FRAMEWORK

In this study, the macroeconomic transmission channel will be followed to study the possible complex relationship between the exchange rate and the unemployment rate. These secondary variables include exports and imports in the balance of payments, GDP, and the rate of inflation. Figure 4.3 is used to illustrate the macroeconomic transmission channel, which provides the framework followed in this study.

Figure 4.3: The macroeconomic transmission channel



Source: van Dyk (2014).

Two transmission paths will be examined known as the transmission path imports and the transmission path exports. In the case of the transmission path imports, the economic theory based on the Phillips curve will be used to determine the relationship between inflation and the unemployment rate (which are both explained in Chapter 2). In the case of the transmission path exports, the Keynesian theory of unemployment will be utilised, which determines the relationship between economic growth and the unemployment rate (also explained in Chapter 2).

4.8 RESEARCH ETHICS

Both the methodology and the morality of research should be sound and defensible in the broad research design (Saunders *et al*., 2009:183). Data for this study is collected from secondary sources from their respective online databases ensuring the reliability and validity of the data; however, it should be considered that confidentiality and privacy of data are not applicable to this study since it is data that is available in the public domain. The data will be analysed in an honest manner so that misrepresentation of the results or

selectively reporting the data are avoided, thereby ensuring and maintaining the objectivity of the research conducted (Saunders *et al*., 2009:199).

4.9 SUMMARY

A quantitative research approach will be followed by using quarterly time series data from secondary sources from 2003 to 2013 from the SARB and Stats SA online databases. The statistical modelling of secondary data is therefore the strategy of inquiry. The macroeconomic transmission channel will be followed to study the possible complex relationship between the exchange rate and the unemployment rate. This will be achieved by using the VECM methodology, which is basically a restricted VAR allowing for short run adjustment dynamics.

CHAPTER 5: DATA ANALYSIS

5.1 INTRODUCTION

The main aim of this section is to determine the relationship between the exchange rate and the unemployment rate by using the VECM modelling technique. Each equation can be estimated by using OLS and employing the reduced form of a VAR. The real exchange rate variable follows two possible transmission paths through either imports or exports respectively.

After stationarity is considered, the cointegration test is preformed to identify long run relationships between variables in order to estimate the VECM, thereafter examining residual diagnostic tests, as well as considering the impulse response and the variance decomposition.

5.2 MODEL SPECIFICATIONS

As explained in Chapter 4, two transmission paths will be examined known as the transmission path imports and the transmission path exports. In the case of the transmission path imports, the Phillips curve describing the relationship between inflation and the unemployment rate will be used (further explained in Section 2.4.3), which can be modified and easily converted into an estimable from as:

(5.1) $$UNEM_t = \beta_0 + \beta_1 CPI + \beta_2 BOPM + \beta_3 RER + U_t$$

where

$UNEM$ = Unemployment rate

CPI = Consumer price index

$BOPM$ = Merchandise imports

RER = Real effective exchange rate

In the case of the transmission path exports, the Keynesian theory of unemployment will be employed. This theory describes the relationship between economic growth and the

unemployment rate (further explained in Section 2.6.1.8), which can be modified and easily converted into an estimable form as:

(5.2) $$UNEM_t = \beta_0 + \beta_1 GDP + \beta_2 BOPX + \beta_3 RER + U_t$$

where

$UNEM$ = Unemployment rate

GDP = Gross domestic product

$BOPX$ = Merchandise exports

RER = Real effective exchange rate

The analytical framework provided in Chapter 4 will be followed in this section; however, before the model estimation can be done, several tests on the data involved in the study must be done. The first of these tests includes the Augmented Dickey Fuller test for unit roots, which is carried out in order to test for stationarity.

5.3 STATIONARITY TEST: AUGMENTED DICKEY FULLER TEST FOR UNIT ROOTS

To determine if the data has a unit root, or in other words are not stationary, the Augmented Dickey Fuller test was conducted on each variable involved in this study. It can be seen in Table 5.1 that the null hypothesis of non-stationarity cannot be rejected when variables are at levels. Variables were differenced once all variables became stationary, and therefore the variables are considered to be integrated of order 1 or $I(1)$.

Table 5.1: Unit root test 2003-2013

Variable	ADF (No Trend / Intercept)	ADF (intercept)	ADF (Trend and Intercept)
Levels			
Real effective exchange rate	0.0360 (0.6890)	-2.4334 (0.1388)	-2.7044 (0.2400)
Imports	2.1441 (0.9914)	-0.6112 (0.8576)	-1.9996 (0.5854)
Exports	2.2198 (0.9928)	-0.2048 (0.9301)	-2.4395 (0.3553)
CPI	3.1648 (0.9994)	0.6076 (0.9884)	-3.3887* (0.0660)
GDP	2.6456 (0.9975)	-1.0316 (0.7337)	-0.6919 (0.9674)
Unemployment rate	-0.5747 (0.4626)	-2.0268 (0.2747)	-1.3898 (0.8503)
First differences			
Real effective exchange rate	-6.3058*** (0.0000)	-6.2246*** (0.0000)	-6.5221*** (0.0000)
Imports	-5.2549*** (0.0000)	-5.6606*** (0.0000)	-5.5881*** (0.0002)
Exports	-5.0216*** (0.0000)	-5.4188*** (0.0000)	-5.3824*** (0.0003)
CPI	-1.7750* (0.0722)	-4.0491** (0.0028)	-4.1711** (0.0103)
GDP	-1.1304 (0.2310)	-2.9774** (0.0449)	-3.1181 (0.1149)
Unemployment rate	-3.0922*** (0.0027)	-3.1098** (0.0331)	-3.3954* (0.0650)

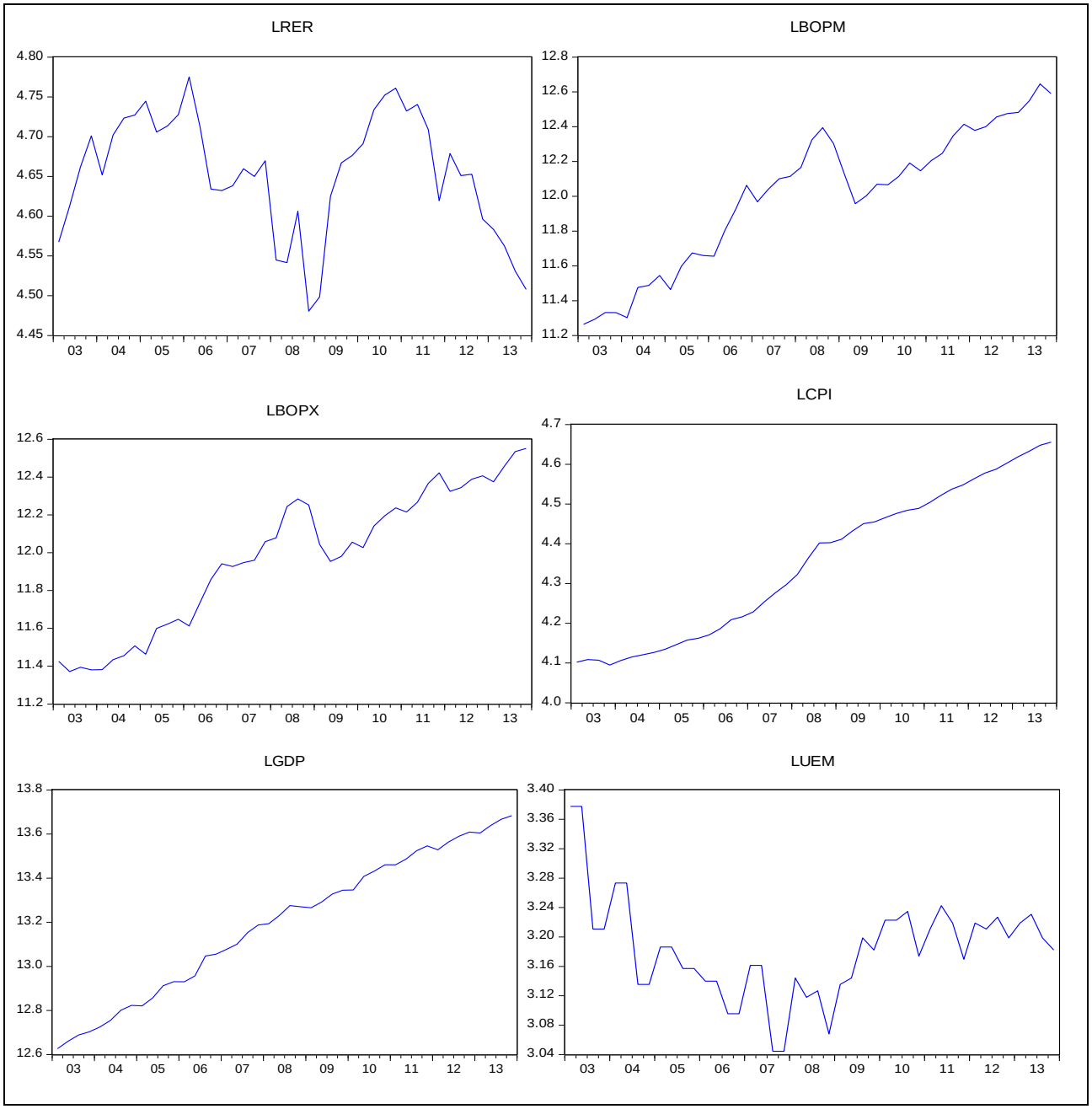
Note: MacKinnon one-sided p-values included in parentheses. ***, **, * indicates significance at 1%, 5% and 10% levels, therefore rejecting null hypothesis of non-stationarity (i.e. variable is stationary).

As seen in Table 5.1, by mechanically differencing variables, the variables became stationary. Nevertheless, useful long run information may be lost when differencing data. Therefore, models based on cointegration and error correction modelling are used to eliminate this problem without needing to difference the data (Brooks, 2003:400). The unit roots found in Table 5.1 are confirmed by the graphical analysis as seen in Figure 5.1. In Figure 5.1 (A), the non-stationarity of the variables is apparent since none of the variables

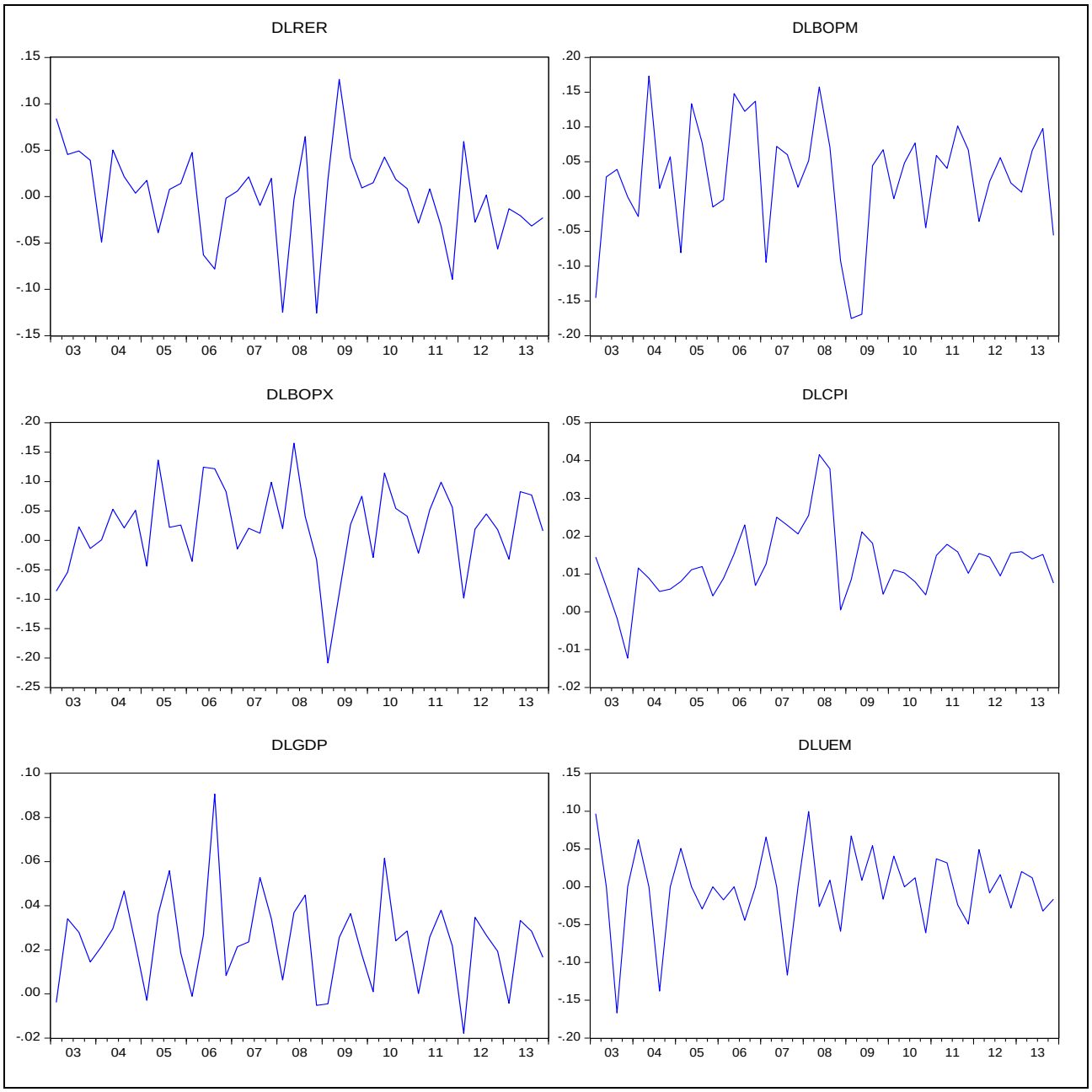
fluctuate around the zero mean. Conversely, in part (B) of Figure 5.1 when the variables are differenced once, they all become stationary, which is visible from the fluctuations around the zero mean.

Figure 5.1: Graphical unit root test 2003-2013

(A) Stationarity test: Levels



(B) Stationarity test: First difference



5.4 THE CORRELATION MATRIX

The correlation matrixes measure the linear relationship between two variables ranging between the number -1 and +1 with +1 being perfectly positively correlated. However, the closer values come to 0 means either that no relationship exists or that the relation is not linear (Barnes, 2012:1). A strong relationship exists when the absolute value in the correlation exceeds 0.6. The correlation matrix is done to avoid the problems associated with the interpretation of cointegrating vectors by including a large number of variables. By

guiding the variable selection, the pairwise correlation matrix can be used to avoid this problem (Brooks, 2003:434).

Table 5.2: Correlation matrix_ Transmission path imports

	LRER	LBOPM	LCPI	LUEM
LRER	1.000000			
LBOPM	-0.401641	1.000000		
LCPI	-0.305047	0.919430	1.000000	
LUEM	0.080696	-0.264451	0.027135	1.000000

From Table 5.2 it can be gathered that a strong correlation exists between the CPI and imports because most of SA products are imported, which may lead to inflation. It can also be observed that no other evidence of strong correlation exists; as a result there is no evidence of multicollinearity.

Table 5.3: Correlation matrix_ Transmission path exports

	LRER	LBOPX	LGDP	LUEM
LRER	1.000000			
LBOPX	-0.381053	1.000000		
LGDP	-0.263244	0.972927	1.000000	
LUEM	0.080696	-0.179311	-0.098035	1.000000

Table 5.3 indicates that a strong correlation exists between the GDP and exports because an increase in exports leads to a higher growth rate through the increase in production. It can also be observed that no other evidence of strong correlation exists, and as a result there is no evidence of multicollinearity.

5.5 THE LAG LENGTH INFORMATION CRITERION

The degrees of freedom can be influenced by the lag length k criterion, which can also greatly affect the Johansen cointegration test. Therefore it is crucial to determine the optimal lagged length by using multivariate versions of information criteria, which includes the sequential modified likelihood ration (LR), Akaike information criterion (HQ), final prediction error (FPE), Schwarz information criterion (SC), and the Hannan-Quinn information criterion (HQ). These results may produce conflicting results, therefore a priori

knowledge of economic theory should also be considered when selecting the appropriate lag length (Brooks, 2003:304).

Table 5.4: Lag length information criterion_ Transmission path imports

VAR Lag Order Selection Criteria
Endogenous variables: LUEM LCPI LBOPM LRER
Exogenous variables:
Sample: 2003Q1 2013Q4
Included observations: 44

Lag	LogL	LR	FPE	AIC	SC	HQ
1	359.1025	NA	1.99e-12	-15.59557	**-14.94677***	-15.35496
2	383.8999	40.57760	1.35e-12	-15.99545	-14.69786	-15.51424
3	415.1404	**45.44071***	**7.03e-13***	-16.68820	-14.74181	**-15.96639***
4	431.3777	20.66567	7.56e-13	**-16.69899***	-14.10380	-15.73657
5	438.1982	7.440496	1.33e-12	-16.28174	-13.03776	-15.07871

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

Table 5.5: Lag length information criterion_ Transmission path exports

VAR Lag Order Selection Criteria

Endogenous variables: LUEM LGDP LBOPX LRER

Exogenous variables:

Sample: 2003Q1 2013Q4

Included observations: 44

Lag	LogL	LR	FPE	AIC	SC	HQ
1	334.2960	NA	6.13e-12	-14.46800	**-13.81920***	-14.22740
2	347.0712	20.90485	7.20e-12	-14.32142	-13.02383	-13.84021
3	376.4570	42.74298	4.08e-12	-14.92986	-12.98347	-14.20805
4	409.8846	**42.54426***	**2.01e-12***	**-15.72203***	-13.12684	**-14.75961***
5	424.8083	16.28035	2.44e-12	-15.67310	-12.42912	-14.47008

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Although the information provided in Tables 5.4 and 5.5 respectively show different lag lengths, Brooks (2003:294) considers it to be preferable to have the same lag length for both equations. Therefore, based on the information provided in Table 5.4 and Table 5.5, the maximum lag length chosen is 4. Following the determination of the optimal lag length, the tests regarding cointegration between variables can be done.

5.6 COINTEGRATION TEST

To determine the order of integration between variables r and the optimal lag length, k is compulsory in order to implement the Johansen cointegration test for the VAR system.

Table 5.6: Cointegration test of transmission path imports

Sample: 2003Q1 2013Q4 Included observations: 44 Series: LRER LBOPM LCPI LUEM					
Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	2	4	3	1	4
Max-Eig	3	1	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999).

Table 5.7: Cointegration test of transmission path exports

Sample: 2003Q1 2013Q4 Included observations: 44 Series: LRER LBOPX LGDPI LUEM					
Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	3	3	0	0	1
Max-Eig	3	1	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999).

Tables 5.5 and 5.6 provide a summary of the trace and maximum eigenvalue test for cointegration. According to Luintel and Khan (1999:392), in testing for cointegration the trace test had shown to be more robust than the maximum eigenvalue test. Since the trace and eigenvalue test may yield conflicting results, the cointegration vector is estimated and examined based on interpretations of the cointegrating relations. The discovered cointegration shows that there is a minimum of one cointegrating vector and the results are also consistent with economic theory. The null hypothesis cannot be rejected of no cointegration among variables, thereby confirming that $r = 1$.

Although Table 5.1 showed that all the variables are non-stationary, in Tables 5.5 and 5.6 it can be seen that a long term relationship does exist between variables, or in other

words, there is cointegration, therefore the VECM may be estimated without differencing the data.

5.7 THE VECTOR ERROR CORRECTION MODELLING

The VECM will be estimated in this section, which does not only contain long run information, but also indicates short run relations between variables. To combine both long and short run properties, the Johansen and Juselius (1990:169-210) approach can be used, while at the same time maintaining stationarity in all variables. In the previous steps the cointegration test were obtained and the optimal lag length was determined. This information was used to specify the VECM estimations presented in Table 5.8 and Table 5.9.

5.7.1 Results and interpretations

Table 5.8: The vector error correction model_ Transmission path imports

Vector Error Correction Estimates
Sample: 2003Q1 2013Q4
Included observations: 44
Standard errors in ( ) and t-statistics in [ ]

Cointegrating Eq:	CointEq1			
LUEM(-1)	1.000000			
LCPI(-1)	-1.414105			
	(0.19911)			
	[-7.10199]			
LBOPM(-1)	0.845109			
	(0.11697)			
	[7.22498]			
LRER(-1)	0.808441			
	(0.21274)			
	[3.80010]			
C	-10.93317			
Error Correction:	**D(LUEM)**	**D(LCPI)**	**D(LBOPM)**	**D(LRER)**
CointEq1	-0.153774	0.061466	0.428350	-0.604389
	(0.13969)	(0.02544)	(0.18602)	(0.13304)
	[-1.10084]	[2.41644]	[2.30268]	[-4.54278]

Log consumer price index (LCPI) has a negative and significant long run relationship with the log unemployment rate (LUEM) (based on the top section of Table 5.8). In other words, an increase in inflation in SA will lead to a reduction in the unemployment rate. This corroborates the theoretical predictions from the Phillips curve. However, in the short run, inflation has a positive relationship with the unemployment rate.

The log merchandise imports (LBOPM) have a positive and significant long run relationship with LUEM, as indicated by the sign and significance of its coefficient. This means that an increase in imports will lead to an increase in the rate of unemployment in

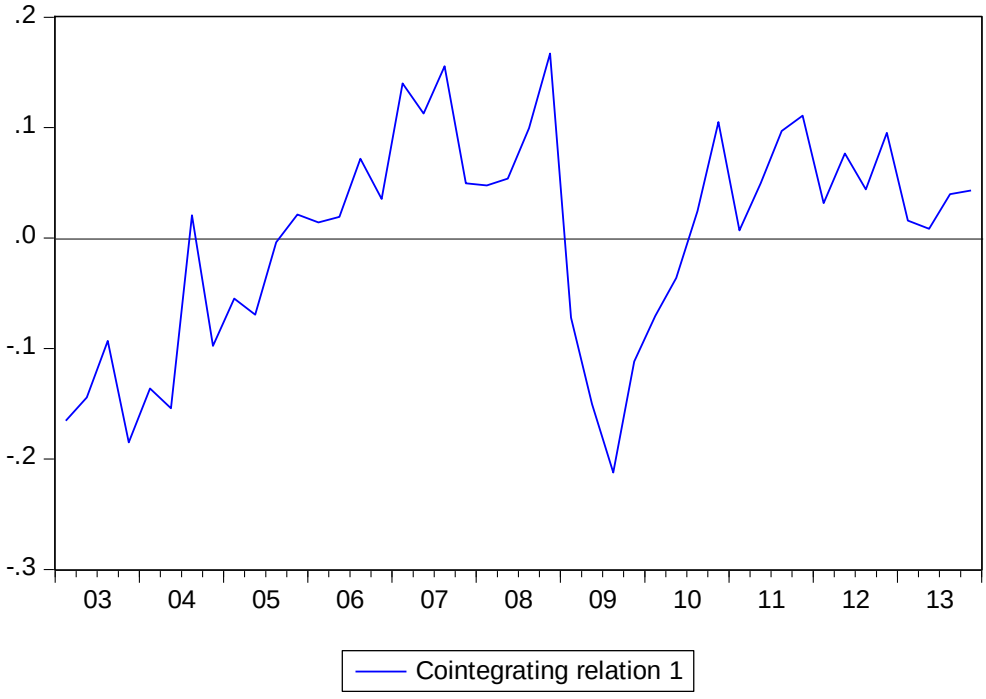
SA. This also corresponds with economic theory as higher imports increase input costs, and this affect GDP negatively, which is necessary for employment creation. The VECM also shows a positive relationship in the short run between imports and the unemployment rate.

LRER has a positive long run relationship with LUEM, as indicated by the significance of its coefficient. In other words, an appreciation in the exchange rate will lead to an increase in the unemployment rate. However, in the short run, the real effective exchange rate has a negative relation with the unemployment rate.

The VECM indicates that both imports and the real effective exchange rate have a positive impact on the rate of unemployment in the long run, while inflation has a negative relationship with unemployment.

The coefficients of the short term error correction terms (cointEq1) show that LRER has the most significant coefficient with a *t*-value of -4.54278, which also has a correct expected negative sign. The LRER constitutes the true cointegrating relationship in the first cointegrating vector.

Figure 5.2: Cointegration result based on estimation_ Transmission path imports



As seen in Figure 5.2, the first vector in the cointegration space appears to be stationary, supporting the conclusions drawn from the VECM estimation in Table 5.8.

Table 5.9: Cointegration_ Transmission path imports

Sample: 2003Q1 2013Q4
Included observations: 44
Series: LUEM LCPI LBOPM LRER
Lags interval: 1 to 4

Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	2	2	2	2	2
Max-Eig	2	2	2	2	1

*Critical values based on MacKinnon-Haug-Michelis (1999).

In the VECM, cointegration was found between the unemployment rate and its determinants by using the Johansen cointegration test. Therefore it can be said that the unemployment rate is subjected to permanent changes due to changes in the unemployment fundamentals (including the exchange rate). Estimates of both long and short run dynamics were provided in the estimation of the VECM as a result of evidence of cointegration.

Table 5.10: The vector error correction model_ Transmission path exports

Vector Error Correction Estimates
Sample: 2003Q1 2013Q4
Included observations: 44
Standard errors in ( ) and t-statistics in [ ]

Cointegrating Eq:	CointEq1			
LUEM(-1)	1.000000			
LGDP(-1)	0.432118			
	(0.48819)			
	[0.88514]			
LBOPX(-1)	-0.592407			
	(0.45187)			
	[-1.31103]			
LRER(-1)	-0.787755			
	(0.45121)			
	[-1.74585]			
C	1.868323			
Error Correction:	**D(LUEM)**	**D(LGDP)**	**D(LBOPX)**	**D(LRER)**
CointEq1	-0.037135	-0.040446	-0.272263	0.248753
	(0.07447)	(0.02962)	(0.12165)	(0.07408)
	[-0.49867]	[-1.36550]	[-2.23807]	[3.35792]

The log gross domestic product (LGDP) has a positive but insignificant long run relationship with LUEM. In other words, an increase in the GDP will result in an increase in the rate of unemployment; however, in the short run, an increase in the GDP seems to reduce unemployment. These results comply with the results of Nyahokwe (2013:116) since growth does not translate into unemployment reduction in the long run, which is an indication of jobless growth in SA.

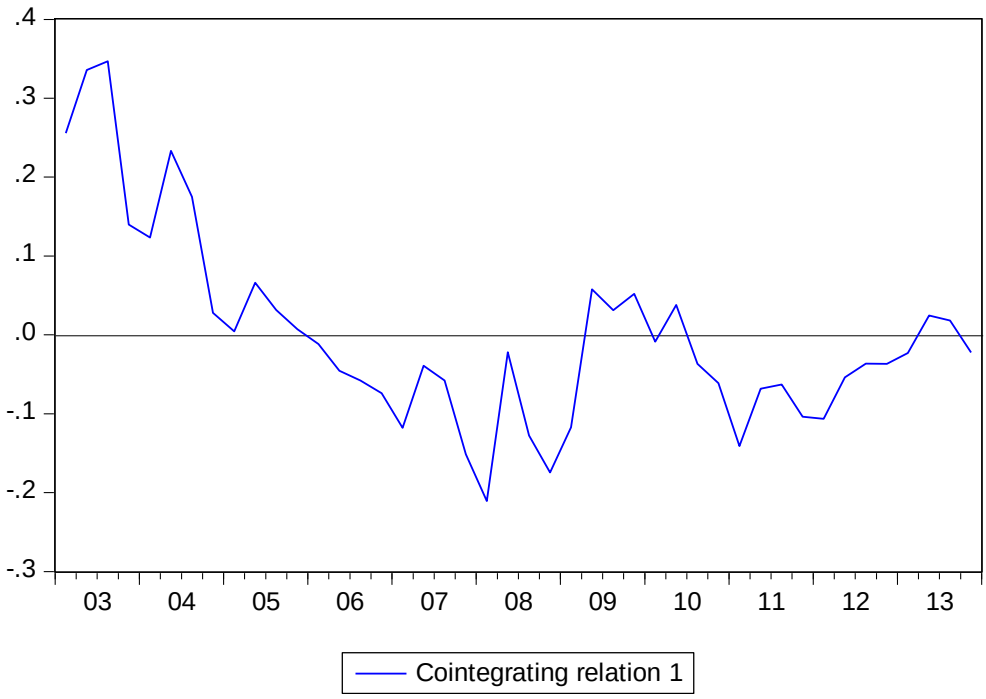
LBOPX has a negative long run and short run relationship with LUEM. This relationship was found to be statistically significant for the short run, but not for the long run. This means that in SA, an increase in exports will lead to a reduction in the unemployment rate.

This complies with economic theory in the sense that an increase in exports causes an increase in production, hence GDP, thereby reducing the rate of unemployment.

LRER has a negative insignificant long run relationship with LUEM. In other words, a depreciation in the exchange rate will lead to an increase in unemployment. Conversely, in the short run, the real effective exchange rate has a significantly positive relationship with the LUEM, corresponding with economic theory.

The coefficients of the error correction terms (cointEq1) show that LRER has the most significant coefficient, with a t-value of 3.35792 also showing the correct expected positive sign, while other variables have the wrong sign. LRER constitutes the true cointegrating relationship in the first cointegrating vector.

Figure 5.3: Cointegration result based on estimation_ Transmission path exports



As seen in Figure 5.3, the first vector in the cointegration space appears to be stationary, supporting the conclusions drawn from the VECM estimation in Table 5.10.

Table 5.11: Cointegration_ Transmission path exports

Sample: 2003Q1 2013Q4
Included observations: 44
Series: LUEM LGDP LBOPX LRER
Lags interval: 1 to 4

Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	2	2	2	1	1
Max-Eig	2	2	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999).

In the VECM, cointegration was found between the LUEM and its determinants by using the Johansen cointegration test. Therefore it can be said that the unemployment rate is subjected to permanent changes due to changes in the unemployment fundamentals. Estimates of both long and short run dynamics were provided in the estimation of the VECM as a result of evidence of cointegration.

5.7.2 Residual diagnostic tests

Before the impulse response and variance decompositions in the VECM can be estimated, the models' residuals need to pass the tests of autocorrelation, normality and heteroscedasticity in both the transmission paths for imports and exports respectively.

Table 5.12: Diagnostic tests_ Transmission path imports

(A): Auto Correlation_ LM test

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Sample: 2003Q1 2013Q4
Included observations: 44

Lags	LM-Stat	Prob
1	10.52783	0.8377
2	19.79803	0.2295
3	19.64436	0.2367
4	21.36387	0.1649
5	21.10939	0.1743

Probs from chi-square with 16 df.

Based on the results from Table 5.12 (A), the null hypothesis of no auto correlation in the imports estimation may not be rejected as the p-values are greater than 0.05, therefore no auto correlation exists.

(B): Normality test

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 2003Q1 2013Q4
Included observations: 44

Component	Jarque-Bera	df	Prob.
1	0.796113	2	0.6716
2	0.437516	2	0.8035
3	0.396435	2	0.8202
4	1.170828	2	0.5569
Joint	2.800892	8	0.9462

Results from Table 5.12 (B) indicate that the null hypothesis of normality may not be rejected as the joint p-value of the Jarque-Bera test statistic of 0.9462 is greater than 0.05. Therefore, the residuals from the estimation are normally distributed.

(C): Heteroscedasticity (White) test

VEC Residual Heteroscedasticity Tests: No Cross Terms (only levels and squares)
Sample: 2003Q1 2013Q4
Included observations: 44

Joint test:		
Chi-sq	**df**	**Prob.**
345.9646	340	0.4002

Table 5.12 (C) shows that the null hypothesis of no heteroscedasticity may not be rejected based on the p -value of 0.4002, which is greater than 0.05 in the white heteroscedasticity test; therefore, no heteroscedasticity is present in the estimation.

Table 5.13: Diagnostic tests_ Transmission path exports

(A): Auto Correlation_ LM test

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 07/09/14 Time: 17:15
Sample: 2003Q1 2013Q4
Included observations: 44

Lags	**LM-Stat**	**Prob**
1	15.06541	0.5199
2	22.21641	0.1363
3	20.95475	0.1803
4	15.83680	0.4644
5	15.14810	0.5138

Probs from chi-square with 16 df.

Table 5.13 (A) indicates that the null hypothesis of no auto correlation in the exports estimation may not be rejected as the p -values are greater than 0.05, therefore no auto correlation exists.

(B): Normality test

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 2003Q1 2013Q4
Included observations: 44

Component	Jarque-Bera	df	Prob.
1	1.221984	2	0.5428
2	0.675012	2	0.7135
3	0.640140	2	0.7261
4	0.047778	2	0.9764
Joint	2.584914	8	0.9577

Based on the results from Table 5.13 (B), the null hypothesis of normality may not be rejected as the joint p-value of the Jarque-Bera test statistic of 0.9577 is greater than 0.05. Therefore, the residuals from the estimation are normally distributed.

(C): Heteroscedasticity (White) test

VEC Residual Heteroscedasticity Tests: No Cross Terms (only levels and squares)
Sample: 2003Q1 2013Q4
Included observations: 44

Joint test:		
Chi-sq	**df**	**Prob.**
360.2479	340	0.2156

Results from Table 5.13 (C) indicate that the null hypothesis of no heteroscedasticity may not be rejected based on the p-value of 0.2156, which is greater than 0.05 in the white heteroscedasticity test; therefore no heteroscedasticity is present in the estimation.

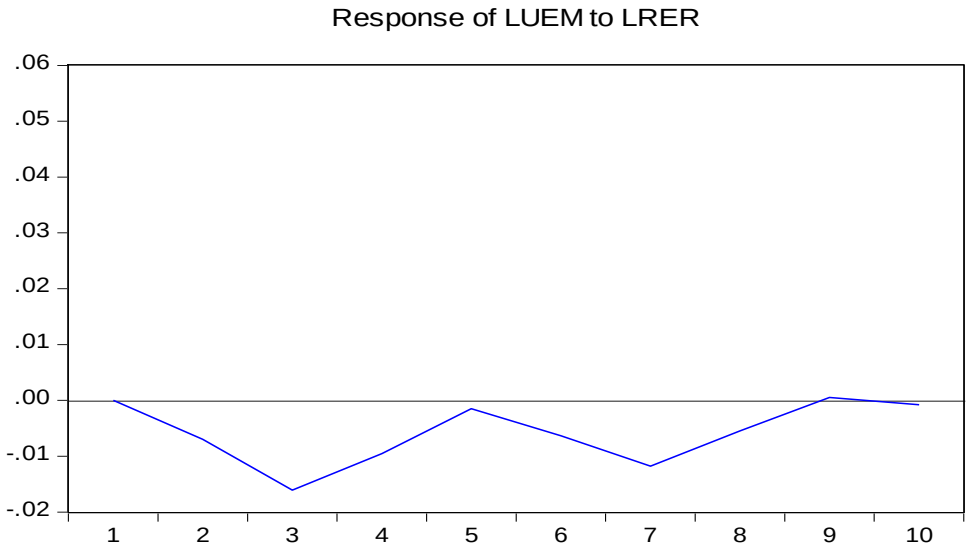
Based on the above results, both estimations' residuals pass all the relevant tests, indicating normality and the absence of heteroscedasticity and autocorrelation.

5.7.3 Impulse response function and variance decomposition

Based on the results in Table 5.12 and Table 5.13 concerning the residual diagnostic tests, the VECM of the transmission path imports and exports respectively generated the data process fairly well since the models passed the tests of autocorrelation, normality and heteroscedasticity. Because the model is free from autocorrelation, non-normality and heteroscedasticity, it can be useful for forecasting by using the impulse response function and variance decomposition to measure the speed of adjustment in the unemployment rate following a shock in the system. In other words, the way in which variables react to a shock in another variable can be determined. This study aimed to analyse mainly the impact of a shock in the exchange rate on unemployment following two different transmission channels. The following section provides the results from each of the estimations.

5.7.3.1 Transmission path imports

Figure 5.4: Impulse response of unemployment to a shock in real effective exchange rate



In the import transmission path, the unemployment rate will decrease due to a shock in the real effective exchange rate. In other words, if the exchange rate appreciates with one unit, the rate of unemployment will decline for nine quarters with the largest decline in the third quarter following a shock in the exchange rate.

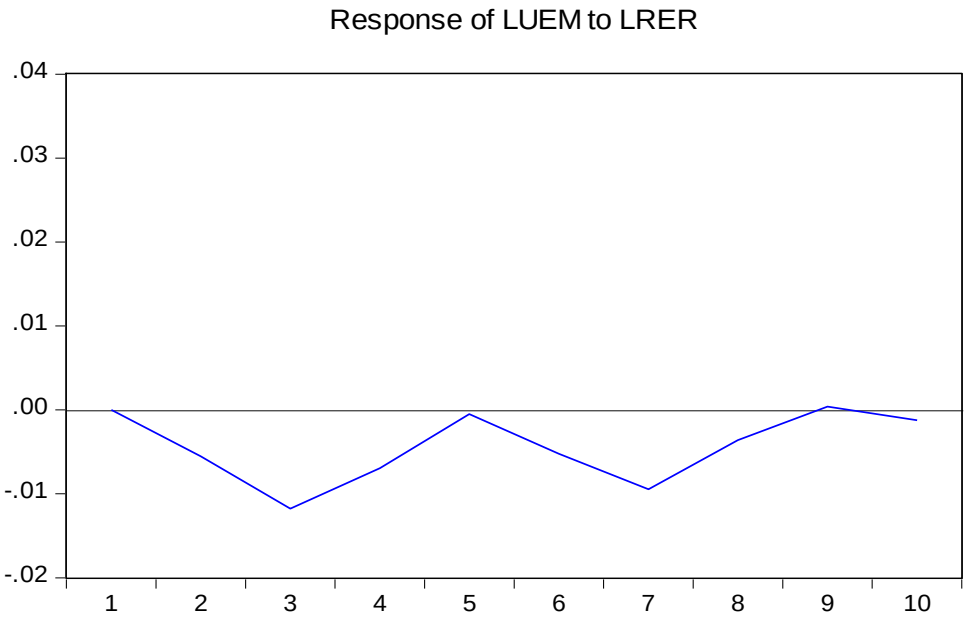
Table 5.14: Variance decomposition_ Transmission path imports

Variance Decomposition of LUEM:					
Period	**S.E.**	**LUEM**	**LCPI**	**LBOPM**	**LRER**
1	0.040308	100.0000	0.000000	0.000000	0.000000
2	0.047432	95.90161	0.258184	1.682763	2.157439
3	0.050560	85.59974	0.228130	2.152970	12.01916
4	0.051840	81.71117	0.488121	2.975178	14.82553
5	0.060590	84.96734	0.735035	3.385881	10.91174
6	0.065794	84.17387	1.477026	4.168271	10.18083
7	0.068719	81.64513	2.135528	3.956993	12.26234
8	0.071713	80.82904	3.620424	3.705111	11.84542
9	0.080192	82.43852	5.079912	3.004608	9.476959
10	0.085715	82.84148	6.224676	2.630859	8.302989

Unemployment explains a smaller portion of its own variance as time passes. Movements in the exchange rate (LRER), imports (LBOPM) and inflation (LCPI) explain an increasing portion of unemployment's variance, however, as time passes this declines. Apart from unemployment itself, the largest portion of the variance in unemployment can be explained by the exchange rate, which shows a significant increase in the portion of the variance in the short run, while diminishing slightly in the long run.

5.7.3.2 Transmission path exports

Figure 5.5: Impulse response of unemployment to a shock in real effective exchange rate



In the export transmission path, the unemployment rate will decrease due to a shock in the real effective exchange rate, indicating similar patterns found for the import transmission path. In other words, if the exchange rate appreciates with one unit, the rate on unemployment will decrease for nine quarters with the largest decline in the third quarter following a shock in the exchange rate.

Table 5.15: Variance decomposition_ Transmission path exports

Variance Decomposition of LUEM:					
Period	**S.E.**	**LUEM**	**LGDP**	**LBOPX**	**LRER**
1	0.037692	100.0000	0.000000	0.000000	0.000000
2	0.044848	96.77213	0.182366	1.533761	1.511744
3	0.048595	89.24972	0.526939	3.088202	7.135139
4	0.052187	82.45735	1.530304	8.057955	7.954392
5	0.061869	83.57193	1.231429	9.530530	5.666108
6	0.066137	84.63658	1.086164	8.690929	5.586324
7	0.069200	82.42476	1.668903	8.939293	6.967041
8	0.071427	80.36121	4.207823	8.638321	6.792650
9	0.074539	80.63717	4.795903	8.326905	6.240019
10	0.076895	81.41895	4.700894	7.990463	5.889696

LUEM explains a smaller portion of its own variance as time passes. Movements in the exchange rate (LRER), the GDP (LGDP) and exports (LBOPX) explain increasing portions of the variance in unemployment, however, as time passes this declines. An increase in the portion of the variance of unemployment explained by the GDP occurs over the long run, while the real effective exchange rate occurs more in the short run diminishing slightly in the long run. Apart from unemployment itself, the largest portion of variance in unemployment can be explained by exports in the long run, which have shown a significant increase in the portion of the variance in the short run.

5.8 SUMMARY

From this chapter it can be concluded that an increase in the real effective exchange rate has conflicting results on the rate of unemployment, depending on the transmission channel followed. The VECM of the transmission path imports revealed that the RER has a positive and significant long run relationship with the unemployment rate; however, in the short run, the exchange rate has a negative, though significant relationship with the

unemployment rate. Nonetheless, the VECM of the transmission path exports indicated that the RER has a negative but insignificant long run relationship with the unemployment rate, conversely, in the short run, the exchange rate has a significantly positive relationship with the unemployment rate.

By testing the impulse response of the unemployment rate due to one unit shock in the exchange rate, it was shown that the exchange rate has a significant effect on the unemployment rate in future quarters in the export, as well as the import transmission paths respectively. The variance decomposition proved that the real effective exchange rate explains the largest portion of variation in the unemployment rate over the short run in both the transmission path imports and exports respectively. Therefore, a stable currency is required not only for trade, but also for economic growth and to keep consumer prices stable.

CHAPTER 6: CONCLUSION

6.1 INTRODUCTION

The exchange rate is considered to be the most important instrument in lowering inflation and enhancing economic growth. Local macroeconomic stability is of vital importance, and the implementation of development policies is enhanced when macroeconomic stability can be achieved. Most of these development policies are aimed at creating more job opportunities and promoting the general well-being of the population. Currency stability is needed to improve international trade and competitiveness, which produces more sustainable growth and hence a lower unemployment rate. By curbing consumer spending to ensure a low inflation rate, and a stable exchange rate through an increase in foreign investment, long-term economic growth will be encouraged according to SARB. The findings of this study will be of value to macroeconomic policy makers to determine which macroeconomic policy will improve SA's economic condition in dealing with two counter stage issues such as the volatile exchange rate and the excessive unemployment rate.

While some research and theory argues that depreciation in the currency is necessary to increase exports hence contributing to economic growth, which may in turn reduce the rate of unemployment, others argue that a depreciated currency would be beneficial to some extent, but should increase the prices of imports. South Africa is highly reliant on imported manufactured and intermediate goods used in the production process, which increases the cost of production, and therefore contributes to cost-push inflation. However, this type of inflation hampers production and growth, and thereby job opportunities. This chapter provides an overview of the study (Section 6.2) and the contributions made by the study (Section 6.3). Recommendations regarding the exchange rate's relationship with the unemployment rate will also be presented in Section 6.4.. Future research opportunities will then be outlined in Section 6.5.

This study aimed to analyse the import and export transmission paths resulting from changes in the exchange rate and its impact on unemployment in SA. Authorities in SA should place a greater focus on stabilising the exchange rate in combination with other policy measures. Currently, a quick response is given to an increase in the inflation rate through the monetary policy tool, namely an increase in the repo rate. Conversely, the South African rand, which is considered to be one of the most volatile currencies

worldwide, is left in the hands of supply and demand in the foreign exchange market and only considered as one of various variables in deciding on monetary policy.

6.2 OVERVIEW OF THE STUDY

In this research study each chapter played a specific role in achieving the outlined objectives of this study. The objectives of the study were used as a guideline to determine the outline of the chapters and to help construct chapters to support the primary objective, which was to determine if there is any significant relationship between the exchange rate and unemployment rate in SA. The following theoretical objectives were formulated to attain this objective:

- Examine the basic theory of the major macroeconomic variables used in the macroeconomic transmission channel;
- Explain and analyse the policies and trends of the macroeconomic variables used in the macroeconomic transmission channel in South Africa form 2003 to 2013;
- Theoretically explain the methods in which data was captured and sampled;
- Theoretically explain the vector autoregressive model, the vector error correction and the cointegration theory; and
- Examine the theoretical modelling framework.

Chapter 2, 3 and 4 aimed to achieve these theoretical objectives of this study. Chapter 2 examined the basic theory of the major macroeconomic variables used in the macroeconomic transmission channel, while in Chapter 3, the policies and trends of the macroeconomic variables used in the macroeconomic transmission channel in South Africa from 2003 to 2013 were explained and analysed. Chapter 4 analysed the research methodology used in this study by explaining in Section 4.2 the research approach, followed by a description of the inquiry strategy and broad research design (Section 4.3). Section 4.4 explained sampling, and in Section 4.5, the data of each of the macroeconomic variables used in the macroeconomic transmission channel used in this study were described. The methodology explaining the vector autoregressive model, the vector error correction and the cointegration theory were explained in Section 4.6; followed by the theoretical modelling framework in Section 4.7.

The empirical objectives formulated to achieve the primary objective of this study were:

- Explain the model specification in the two transmission paths known as the transmission path imports and the transmission path exports;
- Determine the stationarity of all variables included in the macroeconomic transmission;
- Determine the correlation matrix in the transmission path imports and the transmission path exports;
- Estimate the optimal lag length for both the transmission path imports and the transmission path exports;
- Test for cointegration between variables included in both the transmission path imports and the transmission path exports;
- Estimate the vector error correction model in both the transmission path imports and the transmission path exports;
- Test for autocorrelation, normality and heteroscedasticity in both the transmission path imports and exports respectively as part of the residual diagnostic tests; and
- Estimate the impulse response function and variance decomposition in both the transmission path imports and exports as part of forecasting.

Chapter 5 provided the analysis that assisted in achieving the outlined objectives. Section 5.2 explained the model specification in each of the transmission paths following imports and exports. Variables were subjected to stationarity testing for unit roots (Section 5.3). To avoid interpretation problems, a correlation matrix was done in both the transmission path imports and the transmission path exports (Section 5.4). Before cointegration could be tested (Section 5.6) the lag length information criterion (Section 5.5) was first determined in both the transmission path imports and exports. In Section 5.7, the VECM was estimated for both transmission paths imports and exports. After the models were found to be free from autocorrelation, non-normality and heteroscedasticity (Section 5.7.2), they were found to be useful for forecasting by using the impulse response function and the variance decomposition in both the transmission path imports and exports (Section 5.7.3). In the following section the contribution of the study will be discussed.

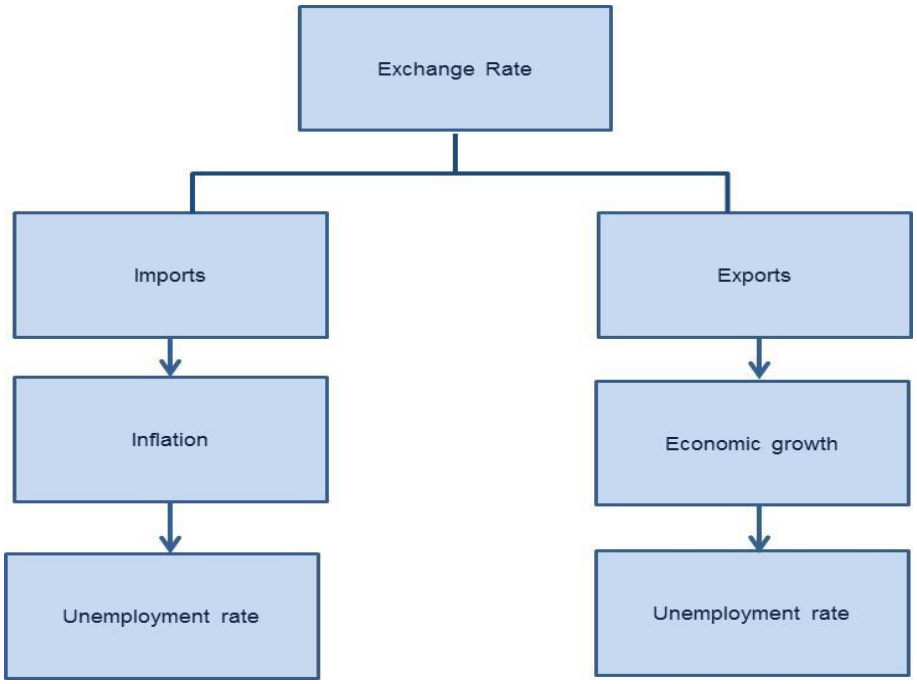
6.3 SUMMARY OF THE STUDY AND CONCLUSIONS

The primary objective of this study was to determine if there is any significant relationship between the exchange rate and the unemployment rate in SA. To achieve this objective, the macroeconomic channel was used and an overview was given of each of the variables

used in the channel. This macroeconomic channels involved in this study are illustrated in Figure 6.1. Each of these variables used in the macroeconomic channel were also analysed in the South African context. An empirical model was employed for SA so as to test the complex nature of this study. This required two paths to be followed, these include:

- The macroeconomic transmission path: imports; and
- The macroeconomic transmission path: exports.

Figure 6.1: The macroeconomic transmission channel

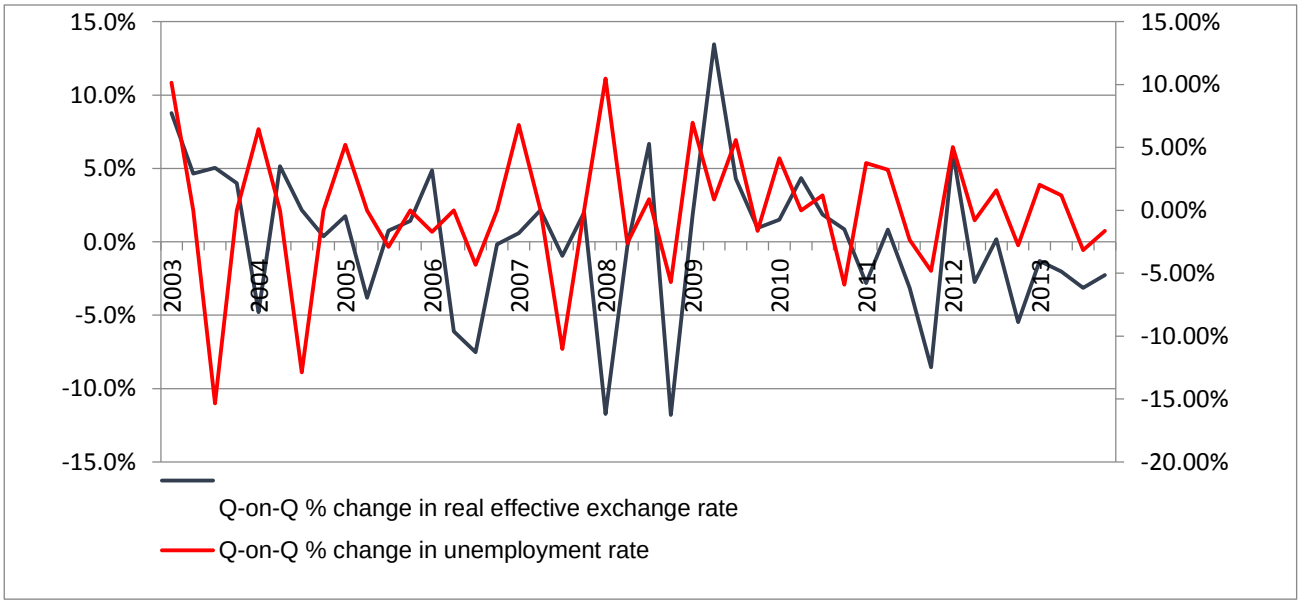


Source: van Dyk (2014).

The transmission path imports are based on the theory of the Phillips curve and the transmission path exports on the Keynesian theory of unemployment, both of which were discussed in Chapter 2. By using quarterly time series data from secondary sources such as the SARB and Stats SA online databases from 2003 to 2013, each of these macroeconomic transmission paths was individually calculated in the VECM model, which is mainly a restricted VAR for nonstationary series that have been found to be cointegrated. The Johansen cointegration and error correction model was preferred over other models to determine both long and short run dynamics.

It can be concluded that an increase in the real effective exchange rate has conflicting results on the rate of unemployment. The VECM of the transmission path imports revealed that the RER has a positive and significant long run relationship with the unemployment rate; however, in the short run, the exchange rate has a negative, though significant, relationship with the unemployment rate. While the VECM of the transmission path exports indicated that the RER has a negative but significant long run relationship with the unemployment rate, conversely, in the short run, the exchange rate has a significantly positive relationship with the unemployment rate. By testing the impulse response of the unemployment rate due to one unit shock in the exchange rate it indicated a significant effect on the unemployment rate in future quarters in the export as well as the import transmission path respectively. The variance decomposition proved that the real effective exchange rate explains the largest portion of variation in the employment rate over the short run in both the transmission path imports and exports respectively. Therefore, a stable currency is required not only for trade, but also for economic growth and to keep consumer prices stable in order to create employment opportunities.

Figure 6.2: Comparison between the real effective exchange rate and unemployment



Source: SARB and Stats SA (2014), author's calculations.

In Figure 6.2, it can be seen that there is a mostly positive relationship between the real effective exchange rate and the unemployment rate. In other words, when a depreciation in the currency occurs, the rate of unemployment increases.

6.4 POLICY IMPLICATIONS AND RECOMMENDATIONS

The results of this study revealed that an increase in the real effective exchange rate has conflicting results on the rate of unemployment in the short and long term. The VECM of the transmission path imports revealed that the RER has a positive and significant long run relationship with the unemployment rate. A depreciation in the currency will lead to an increase in the unemployment rate, which is mainly a result of the decrease in imports and a reduction in the inflation rate due to lower imports. In the short run, the exchange rate has a negative and significant relationship with the unemployment rate. As a result, depreciation in the currency will lead to a reduction in the unemployment rate, as the inflation rate increases due to the higher costs of imports. Although, the VECM of the transmission path exports indicated that the RER has a negative, though insignificant, long term relationship with the unemployment rate. A depreciation in the exchange rate will lead to a reduction in the unemployment rate, which is a result of increases in export volumes, hence production and economic growth. Conversely, in the short run, the exchange rate has a significantly positive relationship with the unemployment rate. A depreciation in the currency will lead to an increase in the unemployment rate which is mainly a result of the decrease in exports, hence a reduction in the economic growth rate.

Since conflicting results of the exchange rate's effect on the unemployment rate in SA occur, depreciating or appreciating the exchange rate too much will have a dire impact on the economy. Therefore, SA requires long term solutions to reduce the unemployment rate with the right macroeconomic policy.

The findings of this study indicate that monetary authorities in SA should focus more on stabilising the exchange rate than on other policy measures. Rand stability is needed, not just for international trade, but for economic growth and to keep inflation under control. This can be done by considering a managed floating exchange rate system together with supply side policies, thereby not only focussing on a stable currency, but also on promoting productivity and efficiency in the economy. The most recent of these policies is the NDP, which was implemented on 19 February 2013. The policy is based on the cycle of development, especially in the quality of education, in order to ensure a bigger worker base to expand opportunities, build capabilities and raise living standards.

In conclusion, a stable exchange rate will increase foreign direct investment in the long run, while promoting competitiveness in international trade relations at a steady rate over time. This would result in a lower inflation rate and consequently an expansion of the level of a higher economic growth rate, which may create more sustainable job opportunities.

6.5 FUTURE RESEARCH OPPORTUNITIES

Volatility in the exchange rate and the high unemployment rate are still controversial issues in SA. Although a managed floating exchange rate regime is suggested in this study, questions still exist as to what extent the exchange rate should be managed to effectively promote more job opportunities in South Africa.

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