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The Contribution of Foreign Direct Investment (FDI) to Domestic Employment Levels in South Africa: A Vector Autoregressive Approach

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Declaration

I, Bongumusa Prince Makhoba, declare that the content of this dissertation is my original work, save for citation and referencing indicated in the text. I further certify that this dissertation has not been and will not be, in part or entirely, submitted for the purpose of obtaining any degree at any other university.

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Abstract

South Africa is a free market economy that promotes Foreign Direct Investment (FDI) in all of its economic sectors, with the aim of accelerating economic growth and increasing job opportunities. Several empirical works have yielded mixed and controversial results with regard to the effects of FDI on employment and economic growth in both developed and developing countries. The primary focus of this study is to investigate the effect of FDI on domestic employment levels in the context of the South African economy. The analyses of the study were carried out using the annual time series data, covering the period of 1980 to 2015. The macroeconomic variables used in the estimation process of the study include employment, FDI, GDP, inflation, trade openness and unit labour costs. The study employed secondary data from the South African Reserve Bank (SARB) and Statistics South Africa (StatsSA) database.

The study mainly used the Vector Autoregressive/ Vector Error Correction Mechanism (VAR/VECM) approach to conduct empirical analysis. However, the study also employed single equation estimation techniques, including the Ordinary Least Squares (OLS), Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS) and Canonical Co-integrating Regression (CCR) models as supporting and confirmatory tools to verify the results produced by the VAR/VECM model. This study provides strong evidence of a significant negative relationship between FDI and employment levels in the South African economy. The results also indicate that employment levels are highly influenced by an increase in economic growth (GDP). Empirical analysis of the study suggests that the effect of economic growth on employment is highly positive and significant in South Africa's economy. Policy recommendations on this effect are given on the basis of empirical findings obtained from this particular research.

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List of Abbreviations and Acronyms

| | |
|--------|--|
| ADF: | Augmented Dickey Fuller test |
| AIC: | Akaike Information Criterion |
| BITs: | Bilateral Investment Treaties |
| CCR: | Canonical Co-integrating Regression |
| CPI: | Consumer Price Index |
| DF: | Dickey Fuller |
| DOEs: | Domestic Owned Enterprises |
| DOLS: | Dynamic Ordinary Least Squares |
| DTI: | Department of Trade and Industry |
| ECM: | Error Correction Model (or Mechanism) |
| EG: | Engle Granger |
| FDI: | Foreign Direct Investment |
| FMOLS: | Fully Modified Ordinary Least Squares |
| FOEs: | Foreign Owned Enterprises |
| FPE: | Final Prediction Error |
| GDP: | Gross Domestic Product |
| GLS: | Generalised Least Squares |
| HQ: | Hannan-Quinn Information Criterion |
| IMF: | International Monetary Fund |
| IRF: | Impulse Response Functions |
| LR: | Likelihood Ratio Test |
| MNEs: | Multinational Enterprises |
| OECD: | Organisation for Economic Co-operation and Development |

| | |
|-----------|---|
| OLS: | Ordinary Least Squares |
| PP: | Phillips-Perron Test |
| SA: | South Africa |
| SARB: | South African Reserve Bank |
| SBC: | Schwarz Bayesian Criterion |
| SIC: | Schwarz Information Criterion |
| SSA: | Sub-Saharan Africa |
| STATSSA: | Statistics South Africa |
| TNCs: | Transnational Corporations |
| TOP: | Trade Openness |
| UK: | United Kingdom |
| UNCTAD: | United Nations Conference on Trade and Development |
| US: | United States |
| USA: | United States of America |
| VAR/VECM: | Vector Autoregressive Model - Vector Error Correction Model |
| VAR: | Vector Autoregressive Model |
| VECM: | Vector Error Correction Model |
| WB: | World Bank |
| WDI: | World Development Indicators |

Chapter One: Introduction

1.1 Introduction and Background

Over the years, foreign direct investment (FDI) flowing to developing nations from the rest of the world has been widely recognised as a significant positive contributor to economic growth and development through job opportunities and technological transfer. However, the present study is aimed at extending and deepening analysis on the contribution of FDI towards domestic employment levels in the South African economy. Several studies indicate that FDI has played a very important role in promoting South Africa's economic growth and job creation. FDI serves as the source of expansion for business opportunities, provide employment opportunities and also increases the level of income for local citizens in the host country. FDI is the flow of capital from an investor's country to an enterprise operating outside of the investor's country (Huang and Ren, 2013; Chinyelu, 2014 and Tshepo, 2014). Foreign investors are keen to invest in South Africa due to favourable economic environment, which includes many facets that are very attractive to FDI. These include access to natural resources, quality infrastructure, potential market size, well-developed financial markets, trade openness, and economic and political stability.

The general economic argument of FDI states that inward FDI promotes growth and enhances employment levels in a host nation. Most studies, which include Mpanju, (2012); Huang and Ren, (2013); Chinyelu, (2014) and Tshepo, (2014) reveal that FDI's effect on employment and economic growth has been favourable in most developing nations. In contrast to this, some researchers, such as Jenkins (2006), Pinn *et al.* (2011) and Onimisi (2014), among others, found an inverse relationship between FDI and employment levels. Some researchers, Inekwe, (2013), Wei, (2013) and Okoro and Johnson (2014), suggested that the FDI impact on economic growth and employment may differ across different economic sectors.

According to the World Investment Report published by UNCTAD (2015), South Africa is the third largest recipient of FDI inflows in Africa, after Nigeria and Mozambique, and the largest FDI provider on the continent. According to a report presented by the Department of Trade and Industry (DTI) (2015), Foreign Direct Investment (FDI) from

the developing world predominantly goes to South Africa, North Africa and oil-exporting countries. The report further concluded that a total of 1 344 FDI projects were recorded from January 2003 to July 2015 in the South African economy. These FDI projects saw the South African economy recording a total capital investment of US\$71.2 billion during this period. A total of 189 724 jobs were created as a result of these FDI projects. The sectors that attracted the majority of these FDI inflows were information technology services; business services; financial and communications services; and industrial machinery, equipment and tools (DTI, 2015).

The same DTI report a report stated that, from January 2015 to July 2015, a total of US\$3.31 billion in FDI inflows was recorded and 5 037 jobs were created in the South African economy. South African FDI inflows from Sub-Saharan Africa recorded a total capital investment of US\$2.08 billion and created 4 647 jobs between the period of January 2003 and July 2015. The key FDI sources for South Africa included, among others, United Kingdom (UK), United States of America (USA), Germany, Australia and India. Conversely, South African FDI outflows mainly went to the following top five destination countries: United Kingdom, Nigeria, Ghana, Zambia and United States of America. The top five sectors targeted by foreign investors were metals and coal, oil and natural gas, food and tobacco, consumer products and communication. South Africa has consistently been able to maintain its position as both the top FDI destination in Africa and a prolific investor in the African continent (DTI, 2015).

FDI is often considered as an important element of economic development in developing countries as it is a prime source of vital economic growth factors such as capital inflows, technological transfer, management know-how, job opportunities and access to the global markets (UNCTAD, 2015). Therefore, inward FDI is a very crucial instrument, at the disposal of policymakers in the world of developing countries like South Africa, for employment generation and economic growth. Most governments in developing countries often promote inward FDI in order to encourage technological "spillovers" from foreign to domestic firms in such a way that employment and growth opportunities are enhanced. With due consideration for the stated importance of FDI, this study seeks to go deeper into the subject matter by taking a closer and more critical look at the contribution that FDI makes to the South African economy.

Most developing countries, such as African and Asian states are more reliant on FDI as a stimulus for domestic economic growth, in comparison to well-developed countries. As a result, policy-makers in these states have tended to put more emphasis on the importance and the benefits that FDI can bring to their domestic economies. Hence, governments in many developing countries, including South Africa and other African states, have adopted and formulated policies that encourage the inflow of FDI. FDI can have critical impacts on a nation's economic development and growth, and therefore, it must be harnessed to achieve the developmental objectives of the country (DTI, 2015).

However, FDI may also have detrimental effects on the economy of the host nation. Jenkins (2006) suggested that FDI may displace domestic investment in such a way that the net effect on employment is less than the number of people employed directly by FDI. In cases where FDI involves the acquisition of domestic firms instead of establishing new enterprises, domestic employment levels will stay the same, and if the foreign investor rationalises the firm, employment levels are even more likely to decrease. Furthermore, the employment opportunities created by FDI tends to favour relatively skilled labour in capital-intensive industries, rather than unskilled labour, which is oversupplied in the labour market (Fedderke and Room, 2006 and Jenkins, 2006). An additional worry for governments in many developing countries is the fear that FDI may enable an undesirable amount of foreign control over a state's resources (Hannon and Reddy, 2012). As a result of these considerations, FDI inflows have become a matter of concern for the governments of many developing countries in the 21st century.

Pinn *et al.* (2011) asserted that FDI can affect employment levels in three different scenarios. Firstly, inward FDI creates job opportunities directly through the establishment of new businesses. Secondly, FDI can maintain employment level by acquiring existing firms. Lastly, FDI can decrease employment levels by withdrawing investments and shutting down local firms through intense competition. Achieving full employment is one of the primary objectives of macroeconomic policy. Hence increasing employment levels is the most important macroeconomic objective in many developing countries where unemployment and underutilisation of resources has led to rising rates of poverty and income inequality (Chinyelu, 2014). The high rate of unemployment makes it difficult to invest in basic needs such as health, and education

and training that will enable the state to increase its production capacity. When the unemployment rate is as high and also as steady as it is in South Africa, it has a negative impact on the country's economic growth and socio-economic development. In addition, unemployment contributes to poverty, social unrest, crime and violence.

The issue of unemployment remains a fundamental socio-economic challenge in the 21st century in South Africa. The unemployment rate has been vacillating at around 25% for the past two decades, with approximately half of the young people completely jobless. This is possibly a major contributing factor contributing to the lower economic growth rate (fluctuating around 3%) that South Africa has experienced in the past two decades. South Africa is among the countries with the worst youth unemployment rate in the world which threatens the future economy of the country. Thus, the economic cost of unemployment includes a reduction in GDP, increasing government debt and government expenditure on social welfare programmes such as social grants and it also promotes social unrest some communities.

In 2009 budget speech, the then Minister of Finance Trevor Manuel announced the response to the unfolding global economic crisis. He stated that the main priority of South African fiscal policy remained job creation and growth acceleration in the national economy. Hence, some new changes to the budget were introduced with the aim of reinforcing macroeconomic stability and providing a temporary cushion to the South African economy (National Treasury, 2009). The major changes made were larger budget allocations to social welfare spending, employment and job creation initiatives, and to increased public works investment to stimulate employment levels and economic growth. In the budget speech of 2015, the Minister of Finance Pravin Gordhan stated that "unemployment remains our single greatest economic and social challenge. The government aims to prioritise measures that will generate employment opportunities in the economy. These include tax incentives for employment and investment, support for enterprise development, skills development and employment creation programmes" (National Treasury, 2015).

The Growth Commission Report postulates that FDI stimulates employment and growth through knowledge and technological transfer. Thus, increasing the level of FDI may raise potential growth and hence, the economy will be able to create more jobs. According to SARB (2015), only 40% of working-age South Africans are

employed. It is estimated that to reduce the unemployment rate to 10% by the year 2025, a total of 7.5 million jobs need to be created if the participation of labour force is 58%. If the labour force participation rate increases to the average of 65% for emerging market, South Africa would need to create a total of 10 million jobs (SARB, 2015).

Several studies have been carried out around the world examining the effect of FDI on growth and employment levels. However, findings vary from one study to the other, in different countries and some are still debated. The primary purpose of the following study is to probe the subject matter by using econometric analyses to further investigate the contribution of FDI to employment in South Africa from 1980-2015 by drawing on data from employment, FDI, Gross Domestic Product (GDP), inflation, trade openness and unit labour costs. This particular study contributes to the body of knowledge by assessing the short and long run effects of FDI on employment in the South African economy. The study attempts to discover the nexus between FDI and employment levels in South Africa using a VAR/VECM model framework with the annual time series data extracted from the South African Reserve Bank (SARB) website and Statistics South Africa (StatsSA) database.

1.2 Statement of the Problem

A study conducted by Huang and Ren (2013) investigate the effects of Chinese investment on employment levels in the South African economy using a survey of 16 Chinese enterprises. Tshepo (2014) and Strauss (2015) estimated a VAR to examine FDI effect on economic growth and employment in the economy of South Africa. The findings of the study reveal a significant ambiguity among the short-and long-term effects between the employed variables. Several empirical studies conducted on the effects of FDI on employment levels demonstrate a significant positive relationship between FDI and employment (Mpanju, 2012; Xu, 2013 and Tshepo 2014). However, some researchers, among others, Jenkins, (2006); Pinn *et al.* (2011) and Onimisi (2014), emphasised that FDI does not create employment and there is a negative link between the two variables. Some researchers, which include Wei (2013) and Inikwe (2014), have suggested that FDI effect on growth and employment differs across different sectors of the economy. Hence, the results from this particular study cannot be generalised. From the researcher's best knowledge, this study seeks to contribute

to the body of knowledge by addressing the ambiguity of the prior studies on the same subject and also by presenting findings that are of value to policy makers.

The study employed a VAR/VECM model framework using the annual time series data from 1980-2015, downloaded from the South African Reserve Bank website. This research will also consider the OLS and other single co-integrating equation models (i.e., FMOLS, DOLS and CCR) as supporting and confirmatory methods in order to verify the consistency of the findings obtained from the VAR/VECM approach and achieve the study's objectives. The study is also distinct from prior empirical studies in its use of a more recent data set and an advanced econometric model, i.e. VAR/VECM model. Even though quite a number of empirical enquiries have been conducted on the effects of FDI on employment levels all over the world, it still remains a point of debate as to whether or not FDI inflows positively and significantly affect employment levels, and thereby, assist developing countries in overcoming the issue of high unemployment. This research, therefore, seeks to add more clarity to the body of literature by providing empirical evidence from the South African perspective.

1.3 Research Aims

The primary aim of the research is to examine the effect of FDI on domestic employment levels in South Africa using annual time series data running from the period 1980-2015. The study will do so by assessing the short and long-run relationships among various macroeconomic components, which include employment, FDI, Gross Domestic Product (GDP), inflation, trade openness and unit labour costs. Furthermore, the study aims to employ both multiple and single equation econometrics models (i.e. the VAR/VECM approach as the main model, and the OLS, FMOLS, DOLS and CCR model framework as supporting and verifying models) to ascertain the contribution of FDI to employment levels in South Africa.

1.4 Research Objectives

As previously mentioned, the main aim of the study is to examine the contribution of FDI to domestic employment growth in the South African economy. The primary aim of this research will be achieved through the following specific objectives:

- to ascertain the significance of FDI to employment levels in the South African economy;
- to investigate the short-run and long-run empirical relationship between FDI, employment, GDP, inflation, trade openness and unit labour costs;
- to examine the co-integration between employment, FDI and economic growth;
- to determine the causality effect and correlation among FDI, employment and economic growth in the South African economy.

1.5 Research Hypotheses

The following hypotheses are made to achieve the objectives of this research:

- Hypothesis 1: there is a significant positive impact of FDI on employment levels in South Africa.
- Hypothesis 2: a significant positive relationship exists between economic growth and employment levels in the South African economy.
- Hypothesis 3: a long-run co-integrating relationship exists among variables in the specified model.
- Hypothesis 4: a significant causality exists between employment, FDI and economic growth (GDP) in South Africa.

1.6 Intended Contribution to the Body of Knowledge

The content of the study alludes to both positive and negative roles played by FDI in employment and economic growth in South Africa. The study intends to probe the existing analysis of the subject matter and the conclusions that have hitherto been drawn in relation to it. The author strongly believes that the findings and recommendations of this particular research will be valuable to government authorities (such as the Department of Trade and Industry), private investors and policy-makers as well as to a number of global researchers, among others. This dissertation utilises various econometric estimation methods, which include both multiple and single equation models. The study specifically uses the VAR/VECM model framework as the main model, with single equation models including OLS, FMOLS, DOLS and CCR, as verifying models in order to achieve the study's objectives and interrogate the hypotheses as previously stated in sections 1.4 and 1.5.

Hence, the researcher uses OLS, FMOLS, DOLS and CCR models as supporting and confirmatory models. Furthermore, these different estimations allow the researcher to compare findings from different models and be able to derive more conclusive and reliable evidence with regards to the contribution of FDI on employment levels in the South African economy. This particular research shall provide the government officials and policy-makers with the relevant and reliable information on the employment effect of FDI inflows, FDI trends and their contribution to economic growth in South Africa. Hence, a clear presentation and understanding of the results from this research will assist the government, policy-makers, and monetary institutions to formulate and execute effective and accurate FDI policies for South Africa.

1.7 The Organisation of the Study

A research is a systematic, methodological, ethical and practical way of conducting an effective investigation in an attempt to solve practical problems and increase the body of knowledge in different fields of study. This study will be organised as follows:

Chapter 1: Introduction

The introductory chapter introduces the research title, gives the background of the study, outlines the problem statement, provides the aims and objectives of the research, as well as research hypotheses, and the structure of the thesis.

Chapter 2: Theoretical Literature Review

This chapter will cover the theoretical framework underpinning the research title, drawing from existing work that has been done by different global researchers.

Chapter 3: Empirical Literature Review

This chapter will focus on the empirical framework underpinning the research topic, drawing from existing work done by different global researchers on the same subject.

Chapter 4: Research Methodology

Chapter 4 provides a discussion of all applicable statistical estimation techniques, as well as model specifications that will be employed in the estimation and interpretation process in Chapter 5. This chapter also deals with data collection and methods that will be used in the collection of secondary data for this research.

Chapter 5: Empirical Analysis and Results Interpretation

Chapter 5 deals with the analysis of empirical estimation procedures that will be undertaken, as well as the presentation, discussion and interpretation of the results.

Chapter 6: Conclusion and Policy Recommendations

This chapter will summarise the key findings of this research, draw conclusions, note implications and make policy recommendations based on the study's quantitative outcomes. It will also outline the study's strengths and weaknesses, and provide recommendations for prospective studies.

Chapter Two: Theoretical Literature Review

2.1 Introduction

This part of the study focuses on a review of the theoretical framework, drawn from different macroeconomic and microeconomic theories, underpinning the relationship between FDI and employment. Firstly, an overview of the theoretical links between FDI and employment levels is provided, followed by a review of empirical studies into this relationship. Furthermore, the literature observed in this particular study looks at multiple perspectives of the subject matter from South Africa, other African countries and from international studies. The discussion of different views from relevant theoretical works explaining different approaches to employment and FDI is articulated in this chapter. Different economic theories that have been used to support the nexus between FDI and employment, as well as economic growth, will be discussed.

2.2 The Theoretical Literature

A theoretical framework in this study is articulated to provide a presentation of different time-tested economic theories that embody the relationships between specific macroeconomic variables included in the study. Specifically, the study presents theories underpinning FDI, employment or unemployment and economic growth.

2.2.1 Theories of FDI on Macroeconomic Level

There are several theories that provide the motivation and determining factors of FDI. Das (2007) asserted that FDI theories are classified into macro-level and micro-level FDI theories. The macroeconomic FDI theories focus on macroeconomic factors that determine FDI in the economy. From the macroeconomic perspective, FDI is the flow of capital from one investing country to another and it is reflected in the balance of payments of the country (Denisia, 2010). On the other hand, microeconomic theories focus on the motivation of FDI associated with domestic firms (Das, 2007). The macroeconomic theories of FDI include capital market theory of FDI, dynamic macroeconomic theory, FDI theories of exchange rates, FDI theories based on

economic geography, gravity approach to FDI, FDI theory based on institutional analysis and FDI theory of international trade (Das, 2007; Denisia, 2010).

2.2.1.1 The Capital Market Theory

The theory of the capital market is the oldest theory of FDI developed in the 1960s. Capital market theory claims that FDI is mainly determined by the interest rates of the country (Das, 2007). Basically, this theory alludes to three different positions by which FDI is attracted in developing countries. The first one is that undervalued exchange rate ensures that host countries operate under lower production costs. Secondly, long-term investment in developing countries depends more on FDI than the purchase of securities in the stock market, since there are no organised securities in existence in the majority of developing countries. The third and last position is that FDI allows control of a host country's assets where there is limited information about securities in that nation (Das, 2007).

2.2.1.2 The Dynamic Macroeconomic FDI Theory

The theory of dynamic macroeconomic FDI asserts that investments depend on changes in the macroeconomic environment (Lall, 2000; Lall and Narula, 2004; also cited by Das, 2007). Moreover, the macroeconomic environment includes GDP, domestic investment, exchange rate and trade openness, which are considered as the main determinants of FDI in any economy. This theory further asserts that FDI is a long-term strategy of MNCs. It also puts emphasis on the hysteresis effect of FDI in the economy (Das, 2007).

2.2.1.3 FDI Theory of Exchange Rate

This theory analyses the relationship that exists between FDI and exchange rate fluctuations. The FDI theory of exchange rate explains how the flow of FDI affects exchange rates in the economy. This theory sees FDI as a tool for exchange rate reduction in the economy of the country (Cushman, 1985; also cited by Das, 2007 and Okafor, 2014). Cushman (1985) provided empirical evidence showing that a rise in the exchange rate of a currency relative to the United States Dollar (USD) increases levels of FDI made by US investors, while a foreign currency appreciation relative to the USD reduces the country's FDI. Cushman concluded that the appreciation of USD led to a

reduction of FDI by 25% in U.S during that period (Denisia, 2010; Nayak and Choudhury, 2014).

2.2.1.4 FDI Theory Based on Economic Geography

The FDI theory of economic geography explains the reason why internationally successful industries emerge among different countries in terms of natural resources availability, market size and infrastructure etc. This theory explores factors that influence the creation of international production clusters. This theory sees innovation as the most important determinant of FDI in the economy. The theory further explains why some regions or cities are more economically successful than others within the country (as cited by Das, 2007). The economic geography theory also explains different ways that governments can use to control resources by implementing various policies and regulations (Das, 2007).

2.2.1.5 The Gravity Approach to FDI

This theory asserts that higher flows of FDI are more likely to occur between two nations that are relatively close to each other in terms of geography, economy and culture. The theory suggests that the traditional gravity variables include: the level of development, size, distance, common language and other institutional variables such as shareholder protection and openness to foreign investment, as important determinants of FDI flows among countries (Pagano and Volpin, 2004; Das, 2007).

2.2.1.6 FDI Theory Based on Institutional Analysis

The FDI theory based on institutional analysis outlines the importance of the institutional framework in promoting FDI flows among countries. This theory sees the country's political stability as an important factor of a healthy institutional framework. This theory assumes that FDI is heavily promoted by institutional variables such as government policies, rules and regulations. According to this theory, there are four institutions that play an important role in promoting FDI flows, namely government, education, markets, and social culture (Das, 2007).

2.2.1.7 The FDI Theory Based on International Trade

The theory of FDI based on international trade was developed by Smith (1776) and Ricardo (1817) to provide explanations on how trade flows between different countries.

Smith's theory asserted that trade between two nations will take place if each nation has absolute advantage in producing one commodity and disadvantage in producing the other commodity. Ricardo (1817) elaborated on Smith's theory by suggesting that a nation will produce and export one commodity in which they have a comparative advantage, and import the commodity in which they have a comparative disadvantage (Nayak and Choudhury, 2014). However, FDI can be attracted to both industries that have a strong comparative advantage and industries with a weak comparative advantage. FDI flows are set up in order to supply to the local market or to take advantage of cheaply available inputs and other resources.

2.2.1.8 FDI-led growth and Growth-led FDI Hypothesis

The FDI-led growth hypothesis is based on endogenous growth theory (Romer, 1994) which stipulates that FDI is strongly associated with human capital, exports, technological and knowledge transfer, and capital flows. These factors significantly stimulate economic growth through the inflow of FDI (Sunde, 2017). The economy is certain to enjoy the spill-over-effects of knowledge and technology provided by foreign firms (Shakar and Aslam, 2015). These spill-over-effects are likely to bring about progress and improvement in the level of productivity, which will eventually lead to an increase in economic growth. Conversely, the growth-led FDI hypothesis mainly focuses on locational factors, such as market size, as the important determinants of inward-flowing FDI. This theory assumes that an increase in the economic growth of the country will result to an increase in the aggregate demand for both domestic and foreign investments. The growth-led FDI hypothesis suggests that a substantial market size provides a strong opportunity for FDI inflows into the recipient country (Zhang, 2001 and Sunde, 2017).

2.2.2 The Microeconomic Theories of FDI

The microeconomic theories focus on the reasons that motivate investors to invest across national boundaries. The microeconomic theories include the existence of firm specific advantages (Hymer, 1976), monopolistic theory of FDI, oligopolistic theory of FDI, theory of internalisation and eclectic theory of FDI (John Dunning, 2000) (Das, 2007; Denisia, 2010). These microeconomic theories will not be used in later chapters but they are discussed here for the sake of completeness.

2.2.2.1 Existence of Firm Specific Advantage

This theory asserts that firms invest across countries because they observe specific advantages in host's nation such as availability of natural resources, access to raw materials, cheap labour costs and economies of scale. The firm specific advantage theory was developed by Hymer (1976), who suggested that local firms are well informed about local economic environment and hence, there must be some policies and conditions for FDI to operate effectively. Hymer viewed FDI as a firm decision instead of a capital market decision. He also recognises FDI as a way of transforming knowledge and resources in order to do business abroad (Sethi *et al.*, 2003; Das, 2007; also cited by Kang and Jiang, 2012).

2.2.2.2 The FDI Theory Based on Monopolistic Power

Kindleberger (1969) developed the monopolistic theory of FDI. The theory suggests that advantages of TNCs are only useful under market conditions of imperfect competition. These advantages may include sophisticated technology, managerial expertise, patents etc. All these advantages motivate firms to invest abroad in order to fully exploit the greater opportunities for return on investment in the foreign market. The theory asserts that the greater the opportunity of making monopoly profits abroad, the more motivated firms will be to invest abroad. Moreover, foreign firms can only exploit these monopolistic advantages if local government policies and regulations enable them to do so in the host country (Nayak and Choudhury, 2014).

2.2.2.3 The Oligopolistic Theory of FDI

This theory was first introduced by Knickerbocker (1973) on the basis of the imperfect market. The theory presents a model that involves two hypothetical foreign investors – one that produces intermediate products and one that produces final products. These investors decide independently on whether or not they will enter a certain country. Foreign companies often follow the actions of the market leader, i.e. if a market leader chooses to invest in a certain country, then other firms react by investing abroad and hence the oligopolistic market equilibrium is sustained (Lin and Saggi, 2010). Knickerbocker suggested that foreign firms tend to follow one another in terms of deciding on the location of investments. Knickerbocker asserts that oligopolistic reaction increases with the level of concentration and decreases with product diversification in the market (Nayak and Choudhury, 2014).

2.2.2.4 Theory of Internalisation

The theory of internalisation explains the growth of the transnational companies and their reasons for FDI. This theory was introduced by Coase (1937) in a national context, and Hymer (1976) upgraded it into the international context. Hymer suggested that two important determining factors of FDI are the removal of competition in the local market and the advantage that other firms have in particular economic activities. Buckley and Casson (1976) analysed the importance of TNCs using a framework developed by Coase (1937). Buckley and Casson (1976) suggested that firms overcome imperfections in the market by creating their own market internalisation. Buckley and Casson placed more emphasis on the use of intermediate inputs and technology (Hymer, 1976; also cited by Denisia, 2010; Nayak and Choudhury, 2014).

2.2.2.5 The Eclectic Paradigm of FDI

Dunning (1971) developed the Eclectic Paradigm theory of FDI. Dunning (1980) partly focused on theories of macroeconomics and trade, as well as theories of microeconomics and industrial behaviour. Dunning considers the internalisation theory of FDI to be a very important one, however, he argues that this theory only offers a partial explanation of FDI flows (Das, 2007). The eclectic theory is a mixture of three different FDI theories, i.e., Ownership, Locational and Internalisation advantages (abbreviated as OLI) (Denisia, 2010). The eclectic theory states that these three conditions must be met before any FDI flows take place (Nayak and Choudhury, 2014). The advantages of ownership refer to intangible assets that are possessed by the firm exclusively, which may be transferred within MNCs at lower costs, leading to higher incomes or costs reduction. Examples of ownership advantages may include the ownership of limited natural resources, patents technologies, brand, reputation and trademarks etc. The location specific advantages may include the availability of resources, factors of production, market size and cultural relations etc. (Das, 2007; Nayak and Choudhury, 2014 and Okafor, 2014). According to OLI theory, there are four types of FDI with differing objectives:

I. Resource-seeking FDI

This means that foreign companies often invest to exploit natural resources such as minerals and other raw materials in the recipient country.

II. Market-seeking FDI

This refers to the ability of a foreign firm to identify potential markets for their finished products. For example, the automotive industry has invested hugely in the Chinese economy.

III. Efficiency-seeking FDI (global sourcing FDI)

This refers to the ability of a foreign firm to organise its investments in such a manner that they are allocated for the highest possible efficiency of the firm's economic activities.

IV. Strategic asset or capabilities-seeking FDI

Foreign firms often expand their operations by buying existing, local firms to gain specific ownership advantages and sustain their international competitive position.

2.2.3 The Development Theories of FDI

2.2.3.1 Production Cycle Theory

The theory of the production cycle was proposed by Vernon (1966) in order to explain FDI flows from the USA to manufacturing companies in Western Europe industry after World War II. This theory asserts that there are four stages in the product cycle: innovation, growth, maturity and decline (Denisia, 2010). The life cycle theory may be used to analyse the relationship between the life cycle of a product and potential FDI flows. In the innovation stage, foreign firms produce new, unique products for the domestic market and export the surplus in the foreign markets. This theory asserts that FDI flows are mostly observed in the maturity and declining stage (Denisia, 2010).

Basically, this theory refers to a life cycle of a product produced and supplied by a parent firm to a foreign or world market that will eventually be imitated and produced in any country where production cost is cheap (Vernon, 1966, as cited by Das, 2007 and Denisia, 2010). Sethi *et al.* (2003) asserted that this theory says that TNCs set up production facilities in foreign countries for products that are already established, standardised and matured in the parent country. The important factors of the life cycle theory are technological innovation and market expansion (Das, 2007; Denisia, 2010).

2.2.3.2 The Five Stage Theory of John Dunning

This theory claims that countries go through five stages of development and these can be classified according to the propensity of those countries for inward and outward direct investment. In the first stage, there is low incoming FDI since there are no specific advantages except natural resources in the recipient country. The level of demand is minimal due to low income per capita, unstable policies, poor infrastructure and unskilled labour force. There is no outward FDI since there is no specific advantage owned by the domestic firms. In the second stage, there is growing inward FDI due to low labour costs but outward FDI is still low. An improvement in the standard of living attracts more foreign investments into the country (Das, 2007).

In the third stage, inward investment decreases and outward investment increases, leading to an increase in net investment outflow. Domestic companies are getting stronger and developing their global competitive advantages. An increase in FDI inflows leads to high technological capabilities and standardised products. The comparative advantage of low labour costs deteriorates in stage four, and outward investments are directed to the low-wage countries. There is strong outward FDI taking place, seeking advantages abroad where labour cost is cheap. In the final stage, both inward and outward FDI come into the equilibrium and investment decisions are completely based on different strategies possessed by TNCs (Das, 2007).

2.2.4 The Keynesian Theory

The General Theory of Employment, Interest and Money was revolutionary in its central tenet that a market economy will naturally restore itself to full employment level. The main argument of this theory is that the level of employment is determined by the spending of money in the economy and not by the cost of labour, as suggested by neoclassical economics. Keynes (1936) argued that it is wrong to assume that competitive markets will deliver full employment in the long-run or that full employment is at the natural and equilibrium state of a monetary economy (originated from Keynes, 1936; also cited by Gali, 2015). An increase in FDI will, through the multiplier effect, cause output, consumption and employment levels to rise. FDI is thus believed to bring about economic growth and development, and thus increase income for local citizens and raise the level of job opportunities in the economy.

2.3 The Conceptual Literature

A conceptual literature is articulated in order to make conceptual distinctions, and organise views and ideas on how different global researchers view the world economy as a whole. It helps to describe the relationship between specific variables identified in the study. A conceptual framework specifies the variables that will be estimated in the process of the investigation. Moreover, a conceptual literature also outlines the input, processes and output of the whole investigation. Economists often use the conceptual framework to distinguish the relationships between macroeconomic variables (Ravitch and Riggan, 2016).

2.3.1 The Importance of FDI in the Economy

The importance of FDI in the economy has been vividly emphasised by policy makers and government in many developing countries. They have thus established several policies that aim to enhance FDI inflows into their countries, as it is believed that inward FDI significantly improves technology, capital formation and the overall economic growth of the country (Görg and Greenaway, 2004 and Kinda, 2010). Much of the literature suggests that FDI encourages economic growth and development, reduces poverty and also diminishes the savings-investment gap in many developing countries through job creation and by giving more effective access to global markets which boosts the overall productivity of the domestic economy (Ajayi, 2006 and Kinda, 2010).

FDI flows are usually preferable to other forms of international capital flows because they are non-debt creating, non-volatile and their returns solely depend on the profits of the foreign financed projects. FDI flows are important in the economy because they facilitate international trade and promote the transfer of knowledge, skills, and technology from well-developed to developing countries (LDC). The FDI inflows are very vital and valuable in helping LDC to adapt in technological changes and also enable them to play along in international competitive market (Alfaro *et al.*, 2006 and Kinda, 2010).

2.3.2 The Determinants of FDI: Empirical Evidence

The investigation of FDI determinants has attracted several scholars in the global literature. This section provides a discussion of empirical evidence of macroeconomic

variables that explains the importance and reasons of FDI flows among different countries. Some of these macroeconomic variables are included in the hypotheses, theoretical framework and research methodology of the study, and others are articulated because they make economic sense instinctively (Demirhan and Masca, 2008). The most important determinants that have been discussed in different empirical literature by different global researchers include the following determining factors of FDI.

I. Availability of Natural Resources

The availability of natural resources in the country is regarded as one of the important determining factors attracting foreign investments into the country. Many foreign investors usually invest in countries where there is easy access to production inputs such as raw materials and natural resources (Jenkins and Thomas, 2002; Khachoo and Khan, 2012). On the whole, developing countries have large capacity in natural resources such as oil and minerals and these countries are more favoured by foreign investors because of lower costs of production. South Africa is one of these countries blessed with abundant natural resources such as gold, agricultural products and other mineral resources. Hence the country is able to attract large FDI inflows. Developing countries that are rich in natural resources, such as South Africa, Nigeria and Angola are more able to attract large FDI into their economies (Khachoo and Khan, 2012; Akpan, Isihak and Asongu, 2014).

II. Market Size

A large market size is often associated with higher FDI due to larger potential demand in the market and lower costs through economies of scale. According to Vijayakumar, Sridharan and Rao (2010), market size is measured by GDP, GDP per capita and the size of the middle-class population. Artige and Nicolini (2005) suggested that market-seeking FDI often goes to countries with a large market to ensure efficient use of resources. A large market size has the ability to reduce production costs through cheap labour and economies of scale. Hence, large market size has a significant positive impact on FDI (Lim, 2001 and Tintin, 2013). Jordaan (2004) stated that foreign firms often invest in

nations with a large market, where they can receive higher returns on capital inputs (Tintin, 2013 and Akpan, Isihak and Asongu, 2014).

III. Quality Infrastructure

Quality infrastructure plays an important role in attracting inward FDI in the economy, irrespective of what form the infrastructure may take. Asiedu (2002) asserts that a quality infrastructure stimulates productivity levels of investment and enhances FDI. Investing in economic infrastructure is the most important factor of investment climate reform strategy. Infrastructural facilities that promote FDI can be constructed by considering roads, ports, railways, electricity, water, transportation, telecommunications and institutional development (Vijayakumar, Sridharan and Rao, 2010). Asiedu (2002) provided evidence that quality infrastructure promotes FDI into Africa (Moreira, 2010). The manufacturing industry of South Africa has proven to be the best in the world in many specialised sectors, such as railway construction, equipment and machinery for mining industry and synthetic fuels. As a result, the country has been able to attract the largest portion of FDI that comes into Africa from the rest of the world (Asiedu, 2002; Khachoo and Khan, 2012 and Akpan, Isihak, and Asongu, 2014).

IV. Labour Costs

Charkrabarti (2001) explained that a wage rate indicates the cost of labour in the economy. It has been one of the most controversial determinants of FDI in many different studies (Demirhan and Masca, 2008). Numerous theorists suggest that labour costs have a statistically significant effect on FDI, more especially in industries that are labour-intensive. Literally, countries with higher wages often discourage FDI, while those with lower wages attract inward FDI. Vijayakumar, Sridharan and Rao (2010) asserted that higher costs of labour lead to higher production costs, thus leading to the limitation of FDI inflows. Hence, labour cost is expected to have a significant negative effect on inward FDI. Countries with cheap labour costs, such as China, are more able to attract large FDI inflows.

V. Trade Openness

Trade openness is computed as the ratio of net exports to GDP, as shown by the degree to which investment moves in and out of the country. Most of the empirical literature supports the idea that a more open economy is more likely to attract high levels of FDI into the economy. Therefore, trade openness is generally expected to positively and significantly affect FDI as the volume of trade increases (Vijayakumar, Sridharan and Rao, 2010). From the South African perspective, during the apartheid era, the investment climate in the country was such that very little FDI flowed into the economy. The country was not open to trade in the global market, with several capital controls in the form of restrictions and sanctions. When democracy prevailed in 1994, the capital controls were relaxed and the economy was opened to international trade and FDI began to flow into the country in such a way as to more effectively and positively influence the economy (Onyeiwu and Shrestha, 2004; as cited by Ezeoha and Cattaneo, 2012; and Tintin, 2013). Most studies conform to the notion that an open economy encourages more FDI flows into the country and less openness discourages foreign investment (Demirhan and Masca, 2008 and Moreira, 2010).

VI. Political Stability

A country with a stable political environment attracts a large portion of FDI into the economy than those with an unstable political environment. Political instability comprises many different kinds of disruptive events and elements, such as anti-government protests, corruption, political assassinations, frequent and illegitimate changes in government and violent riots etc. These political instabilities automatically decrease the inward FDI because of the uncertainty they bring to the cost and profitability of investment. A less democratic country, with no respect for the rule of law and political and human rights, usually demotivates foreign investors from investing in their economies (Moreira, 2010).

Several empirical studies postulate that political stability has a positive impact on FDI, while political instability and violence have a negative effect on FDI inflows (Onyeiwu and Shrestha, 2004 and Tintin, 2013). A study conducted by Fedderke and Romm (2006) suggested that a stable political environment has a significant positive effect on FDI in South Africa. In contrast to this, a study by Kim (2010)

suggests that a less democratic country, with high government corruption, tends to attract more inward FDI, and countries that uphold political and human rights and maintain robust democracies, tend to attract less (Anyanwu, 2011).

VII. International Reserves

Asiedu (2002) and Khachoo and Khan (2012) asserted that international reserves are also an important determinant of FDI, which can greatly influence capital flows in developing economies. International reserves determine the health of the investment climate of the country. A high level of international reserves in an economy can boost investor confidence and hence attract foreign investors to invest more in the country, whilst lower levels of international reserves often discourage investors from investing in the country (Khachoo and Khan, 2012).

VIII. Fiscal Incentives

Lim (2001) and Whalley and Xian (2010) claimed that fiscal incentives play a very important role in increasing the host country's location advantages. These different incentives may include low corporate taxes and custom duties etc. They are part and parcel of policies that aim to promote FDI inflows into the country. The DTI in South Africa has created industrial development zones (IDZs) to provide fiscal incentives through free importation of raw materials, in order to promote more production from the manufacturing industry (Streak, 1998 as cited by Mugabe, 2005). Hartman (1994) found that corporate taxes have a significant negative effect on FDI inflows of the country. In contrast to this, Porcano and Price (1996) posited that any form of taxes has an insignificant impact on FDI (as cited by Whalley and Xian, 2010).

Figure 2.1: The trends of unemployment rates (1980-2015) in S.A

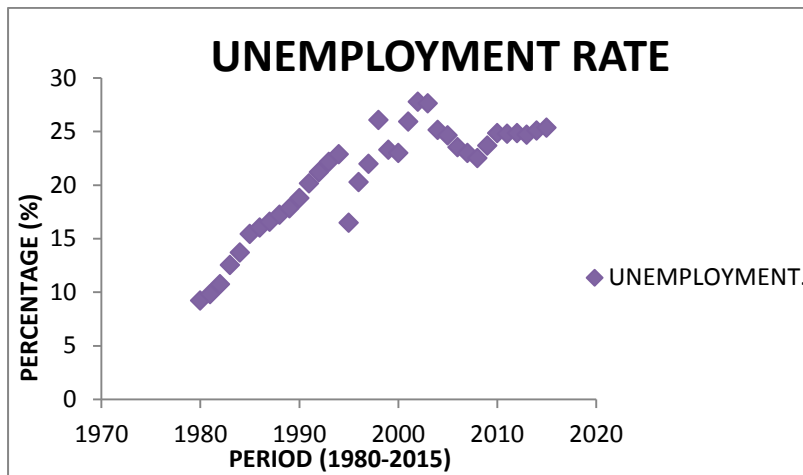
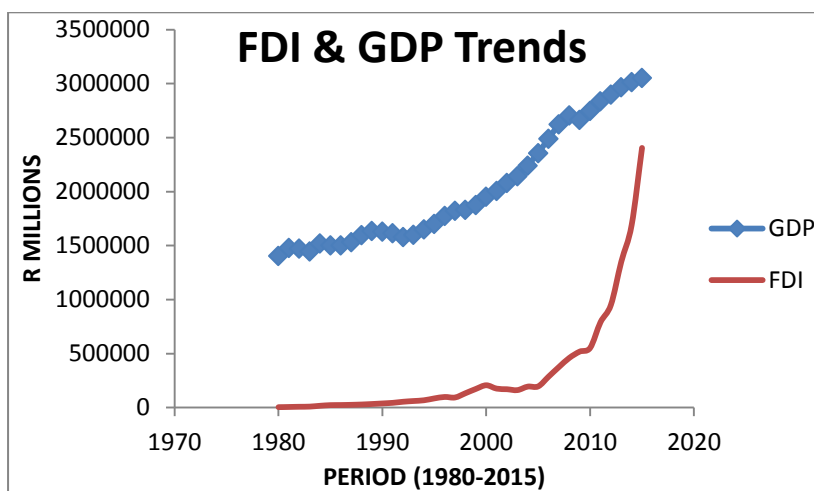


Figure 2.2: The trends of FDI and GDP (1980-2015) in S.A



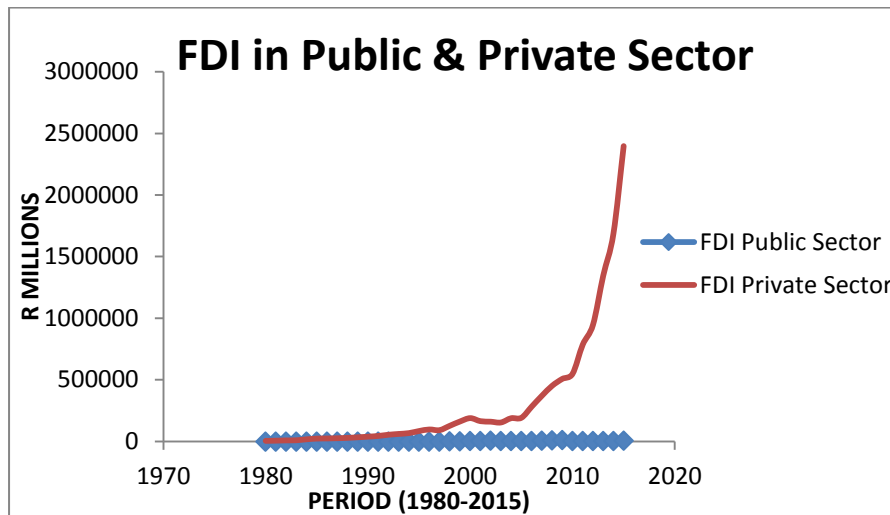
Source: Generated by the researcher, SARB data.

Figures 2.1 and 2.2 show the main trends between FDI, GDP and unemployment rate in the economy of South Africa from 1980 - 2015. It is clearly demonstrated that over the last 35 years, FDI inflows in the South African economy have been increasing gradually. However, FDI inflows witnessed a dramatic increase in the years 2000 and 2008, probably due to the world economic shocks (global financial crisis) that also affected the South African domestic economy. On the other hand, unemployment rate and GDP have been fluctuating around 25% and 3% respectively over the years in the South African economy.

2.3.3 Public and Private Sector Analysis of FDI and Employment in S.A

This section provides graphical analysis of FDI and employment levels in both the public and private sectors of the South African economy for the period 1980-2015.

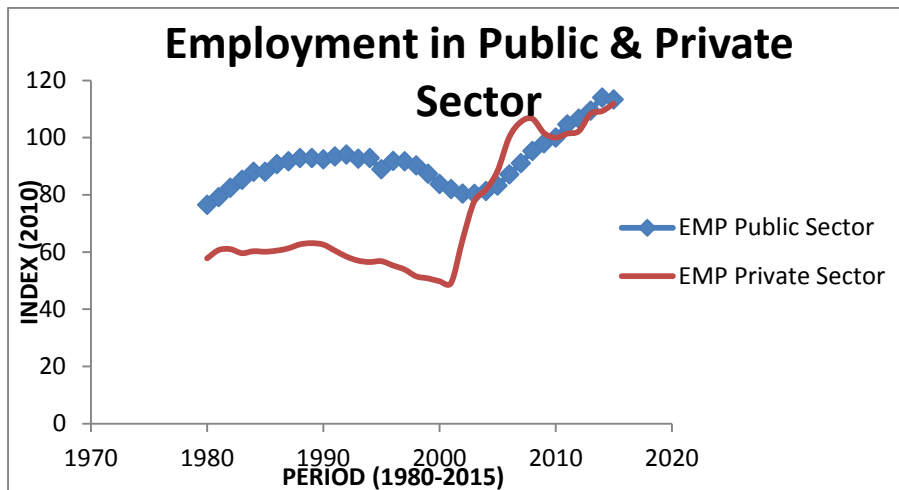
Figure 2.3: FDI invested in public and private sector



Source: Generated by the researcher, SARB data.

Figure 2.3 above shows the amount of FDI (millions) invested in both the public and private sector in South Africa for the period of 1980-2015. The above figures indicate that the value of FDI invested in the public sector was zero from 1980 until 1997, in which year, FDI directed to the public sector started to flow into South Africa's economy. Public sector FDI showed an increasing trend from 1997, reaching an all-time high of R11 236 million in 2009, and thereafter it started to decrease down to R7 397 million in 2015. On the other hand, private sector FDI has shown a constant upward trend from 1980 to 2015, notwithstanding a small decrease in the value of FDI from 2001 to 2003. In 2004, the value of private sector FDI increased again and never went down, reaching an all-time high of R 2 397 033 million in year 2015. The above graphical illustration provides strong evidence that a large amount of FDI is directed to the private sector of the South African economy.

Figure 2.4: Employment in public and private sector



Source: Generated by the researcher, SARB data.

Figure 2.4 above shows the level of employment (index) in both the public and private sector of the economy in South Africa from 1980-2015, with reference to the year 2010 as the base year. The graph indicates that a large source of employment has been the public sector rather than the private sector in South Africa's economy in the period 1980-2015. From the year 1998, public sector employment levels started to decrease and picked up in the year 2007 and never went down, reaching an all-time high of 114 index value in 2014. On the other hand, private sector employment witnessed a slight increase from 1980 to 1990 and a decrease thereafter until 2002. In 2003, private sector employment showed an upward trend, reaching an all-time high of 111 index value in the year 2015. The graphical demonstration of FDI and employment, in both the public and private sector, illustrated above, strongly indicate that a large amount of FDI has been directed to private sector rather than public sector of South Africa's economy. On the other hand, an extremely high number of employment opportunities have been created by the public sector in contrast to the private sector. This is a rough indication of the possibility of no effect or even a negative impact of FDI on employment levels in the South African economy.

2.3.4 The Main Trends and Prospects of FDI in South Africa

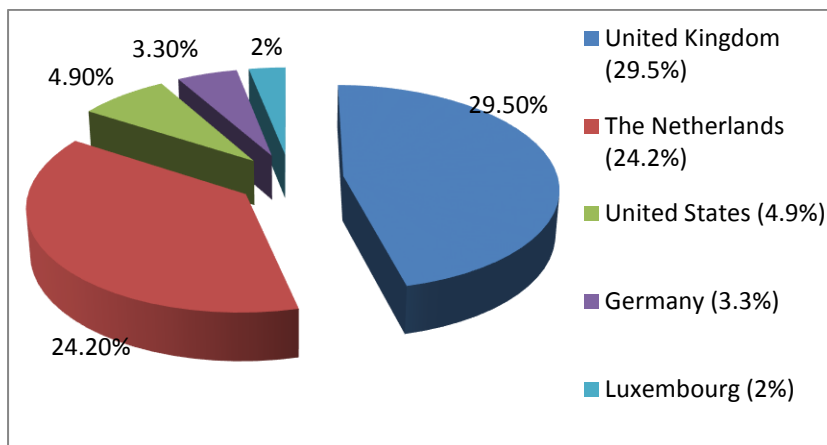
South Africa is a largely free-market economy that promotes inward FDI in both the public and private sectors. There are numerous factors that attract FDI inflows in South Africa, such as access to natural resources and raw materials, openness to international trade and political stability etc. South Africa has great potential for

possible foreign investors compared to other developing countries in the world; however, its record in terms of attracting FDI thus far has been relatively poor. Having said that, FDI has been improving over the years, due to new investments in infrastructural development and other factors attracting inward FDI such as market size, openness to trade, political and economic stability.

It is also imperative to note that the economy of South Africa is still struggling with a number of legislative uncertainties that may discourage foreign investors from investing in the country. However, in the year 2015, the South African government promulgated the Protection of Investment Act, which aims to strengthen the legal safeguards for foreign investors. Nonetheless, South Africa has dropped by a large number of places in the Doing Business ranking published by the World Bank occupying 73rd position out of 189 countries in 2016, compared to 69th of 189 in 2015. Currently, the country is looking for foreign investors for its energy infrastructure projects and in that regard, it has strengthened its partnership with China in order to execute this project. According to the UNCTAD Global Investment Trends Monitor (UNCTAD, 2015), FDI inflows to South Africa dropped by 74% in year 2015.

South Africa is currently ranked as the third largest FDI recipient in Africa, after Nigeria and Mozambique, and is the prolific FDI provider on the continent. Globally, South Africa is ranked 15th among the most attractive economies for transnational companies. In addition to structural issues in the economy, electricity supply, logistics sectors and industrial strikes have been continuously affecting production in the economy and have also proven to be discouraging to investors (UNCTAD, 2015). The main source countries of investment in the South African economy as well as the main invested sectors, are graphically displayed in the following figures, according to the sequence of their contribution to the South African economy.

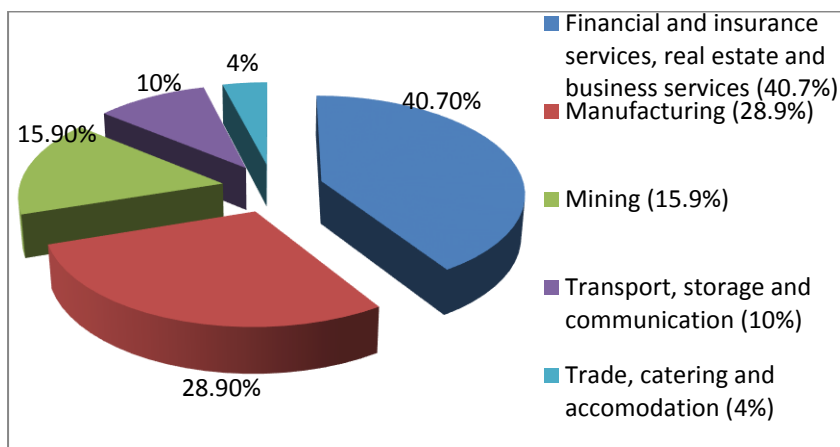
Figure 2.5: FDI inflows into the South African economy, by country



Source: Generated by the researcher, SARB, Quarterly Bulletin March 2017.

Figure 2.5 demonstrates the main investing countries in accordance to their contribution to the South African economy in the year 2015. Ranking at the top is the United Kingdom, contributing 29.5% of total foreign investment to the lowest ranking, Luxembourg, contributing only 2% of aggregate foreign investment into the economy.

Figure 2.6: FDI inflows by industry/sectors into the South African economy



Source: Generated by the researcher, SARB, Quarterly Bulletin March 2017.

Figure 2.6 demonstrates the main sectors that received FDI in the South African economy in the year 2015. At the top of the rankings are the financial and insurance services, real estate and business services with 40.7% of aggregate foreign investment. At lowest ranking is the catering and hotel industry, with only 4% invested into this sector.

2.3.5 The Strengths of Investing in South Africa

There are numerous factors that strengthen the appeal of the South African economy to foreign investors. Some factors include the country's high market potential, well-developed infrastructure, and political and economic stability. South Africa has a well-established democracy with transparent and contested government elections and an appreciation for the rule of law. South Africa has introduced a number of economic reforms that have led to macroeconomic stability and the reduction of taxes and customs for foreign firms. South Africa has one of the largest and most active stock exchanges in the world (JSE). The country has also shifted its focus from traditional industries such as agriculture and mining to manufacturing and services, which contribute a large portion to the economic growth of the country (DTI, 2015).

2.3.6 The Weaknesses of Investing in South Africa

It is also imperative to mention that there are still several challenges that may discourage investors from investing in the South African economy. Firstly, over the past few years, there has been an increase in the incidence of labour and public strikes and protests, which may demotivate investors. Secondly, the issue of corruption and violent crime has been escalating in the country. The supply of electricity is also continuously problematic. Additionally, there is a shortage of high-skilled workers in the labour market and immigration laws make it difficult to hire foreign workers (DTI, 2015). Another important factor that makes foreign investors cautious about investing in South Africa is a clause contained in all bilateral investment treaties (BITs) which is tantamount to expropriation.

These clauses state that an expropriation must be in the public interest, must be lawful and fair without any form of discrimination and with the owner of the expropriated asset receiving compensation. The implication of this is that if investments are protected by BITs, even if there would be an expropriation, investors will also be eligible for compensation as opposed to those who are not covered by BITs. Moreover, without the introduction of new policies that are ideal for investors' interest, foreign investors are more likely to be nervous to invest in the country, since there is no certainty for foreign investors regarding protection under BITs, and thus it will be very difficult to attract FDI inflows into the economy (Schlemmer, 2015).

2.3.7 Government Measures to Promote FDI in South Africa

The South African government has made it possible for foreign investors to invest in business sectors without any strict requirement for government approval. Moreover, there are few restrictions on how much a foreign entity can invest into local businesses. The government has also promulgated various measures and policies that encourage foreign investments, some of these measures include investment incentives, tax and custom rules, and intellectual property rights (DTI, 2015). Some of the government measures that promote FDI inflows into the South African economy are stipulated as follows:

- The Foreign Investment Grant, which is a cash grant that provides about 15% for the purchase of equipment and machinery;
- The Skills Support Programme, which gives an allowance of about 50% for training costs and 30% for salaries of workers, and
- The Strategic Industrial Project Programme which gives foreign firms tax allowances (DTI, 2015).

2.4 Conclusion

This chapter has discussed both the theoretical and conceptual framework related to the study. The theoretical link that exists between FDI and employment levels has been articulated in this chapter. Theories by different global researchers and authors have been thoroughly emphasised in the context of the world economy. Moreover, under the conceptual framework of the study, this chapter has been able to identify and discuss the most important determinants of FDI. From this theoretical and conceptual literature, it will be easy to construct and to choose the appropriate variables required for the application of the econometric modelling analysis. Both the theoretical and conceptual frameworks outlined in this chapter are expected to eventually complement and support empirical literature and the results of the study that will be articulated in Chapters 3 and 5, respectively. The following chapter focuses on the discussion of empirical evidence presented by different international researchers among others on the same subject area, i.e. FDI effects on employment and economic growth across different countries of the world.

Chapter Three: Empirical Literature Review

3.1 Introduction

This part of the study focuses on the discussion of empirical findings underpinning FDI and employment in South Africa and the rest of the world. The central focus of the chapter is to review the empirical literature from different international studies that has been conducted on the impact of FDI and employment levels in both developing and well-developed countries. The effect of FDI on economic growth and employment levels has drawn too much attention from different scholars around the globe. Numerous empirical studies have systematically evaluated the FDI effect on employment levels. The body of this research focuses on the contribution of FDI to employment generation in the South African economy. Empirically, there are numerous studies that have assessed the nexus between FDI and economic growth broadly, however, very few studies have extensively focused on the contribution of FDI to employment levels in the context of developing countries like South Africa.

The empirical findings vary from one study to another in clarifying unique views and recommendations in the context of identical macroeconomic variables which include FDI, employment, GDP, trade openness, unit labour costs and inflation rate. Furthermore, a number of global researchers have reported a positive relationship between FDI and employment. These include Mpanju, (2012); Xu, (2013); Tshepo, (2014) and Mayom, (2015), while some researchers have found a negative relationship (Jenkins, 2006; Binh, 2013; Wei, 2013; Onimisi, 2014 and Strauss, 2015) between FDI and employment levels in their respective nations. Chapter 3 is divided into five different sections. Section 3.1 introduces the chapter. Section 3.2 looks at the empirical studies carried out in South Africa. Section 3.3 focuses on African conducted studies and section 3.4 discusses the empirical literature presented from the rest of the world. Finally, section 3.5 concludes the chapter.

South Africa is one of many emerging market economies that have promulgated quite a number of policy instruments aimed at attracting FDI. According to UNCTAD (2013), the majority of African countries adopted and implemented numerous incentives and macroeconomic policies aimed at promoting FDI inflows after reaching their independence. High unemployment rates constitute a crucial socioeconomic

challenge in many developing countries. FDI is very useful and helpful in increasing the amount and quality of employment and so governments in these countries focus on attracting it. A large amount of FDI is more capital and technological-intensive rather than labour-intensive, thus crowding-out the economies of the host nation in terms of employment creation (UNCTAD, 2013). Robu (2010) asserted that FDI is usually sought by countries that are going through a transition period or those struggling with a severe structural unemployment rate. South Africa has also adopted a number of measures aimed at accelerating growth and development in the domestic economy by putting in place policies that promote and attract FDI inflows into the economy of the country.

3.2 South African Empirical Literature

Fedderke and Romm (2004) studied FDI determinants in South Africa between 1960-2002 using time series data under the VECM method. The findings indicate that FDI impacts positively on South Africa's economic growth. The results also discovered the crowd-out effect of FDI on local investment. Fedderke and Romm (2006) assessed FDI determinants and its impact on growth in the South African economy from 1956 to 2003. Their study revealed a positive long-run effect of FDI on economic growth. It was also found that domestic investment does not crowd out FDI in the short-run. Furthermore, FDI were found to be more capital-intensive rather than labor-intensive in the South African economy. Some of the determinants of FDI in the South African economy include market size; low corporate tax and political stability. The study made a number of policy recommendations.

Moolman *et al.* (2006) investigated the macroeconomic links of FDI and its effect on South Africa's economic growth. The study applied co-integration techniques using time series data from the period of 1970-2003. The empirical results of the study indicate that trade openness; good infrastructure and large market size are important determinants of FDI in the South African economy. The results also reveal a significant positive effect of FDI on South Africa's economic growth.

Asafo-Adjei (2009) investigated the importance of FDI in the economy of South Africa. It was discovered that FDI has a positive influence on growth and development, and a number of developing countries, including South Africa, have been constantly

improving the conditions of attracting FDI inflows into the country and hence its demand has become highly competitive in many developing countries. The findings of the study recommend that even though South Africa has been able to implement FDI-attracting strategies, it is also important to refine some of these policies in order to be successful in terms of attracting FDI that promote growth and development.

Huang and Ren (2013) investigated the effect of Chinese investment on employment generation in the South African economy. The study used a survey from 16 Chinese enterprises located in Johannesburg to assess their impact on employment generation in the South African economy. The findings of the study indicate that Chinese firms increase job opportunities for both skilled and unskilled workers in the country. They touched on the importance of improving the investment enabling environment in order to expand the significant positive impact of Chinese firms on employment and growth of the country's economy. The findings of the survey also suggest that strict labour laws and influential trade unions are vital components that ensure the employment quality of FOEs meets the legal requirements of the country.

A study conducted by Tshepo (2014) assessed the FDI impact on growth and employment from 1990 to 2013 in South Africa. The study employed the Johansen Co-integration test to assess the long-run co-integrating relationship among variables in the model. The empirical results indicate a positive long-run relationship between FDI, GDP and employment levels in the South African economy. The findings also suggest that FDI is an important aspect that stimulates growth and employment levels in the economy of South Africa. Furthermore, the study was able to specify that human capital, return on investment, labour cost, labour disputes and corruption are important factors that influence inward FDI in the South African economy. The study suggests that it is imperative for the South African government to put more emphasis on these factors to make the country a conducive environment for FDI to take place.

Mazenda (2014) studied the impact of FDI on economic growth in the South African economy from 1980-2010. The study was conducted through the use of the Johansen VECM methodology. The variables employed in the methodology include real GDP, FDI, domestic investment and exchange rate. The results reveal that FDI, real exchange rate and foreign marketable debt all have a negative long-run effect on South Africa's economic growth. On the one hand, domestic investments were found to promote economic growth positively and significantly in the long-run. The short-run

results indicate that there is no strong effect of these variables on GDP to restore the long-run equilibrium when there is a shock in the economy.

Strauss (2015) assessed the link between FDI, absorptive capacity and growth in the economy of South Africa. The study used the time series data analysis from the period of 1994-2013 from the World Bank databases. The results reveal significant long-run ambiguity among the employed variables. The study provides evidence that FDI only affects economic growth in the short-term. In contrast to theory, the empirical results reveal that a relatively high level of absorptive capacity is not sufficient to promote the overall economic gains and development.

3.3 Empirical Literature from African Studies

Astatike and Assefa (2005) investigated the nature and determinants of FDI in Ethiopia from 1974 to 2001. The empirical findings show that GDP, exports and trade liberalisation have a positive impact on FDI. In contrast to this, the study found that the economic instability and lack of infrastructural development have a negative effect on inward FDI in the country. Finally, the recommendations of the study were that trade liberalisation, economic and political stability and infrastructural development are essential factors to attract FDI into the Ethiopian economy.

Adewumi (2007) carried out a study about FDI effect on economic growth in African developing countries. The regression analysis indicates a positive long-run effect of FDI on economic growth. A study conducted by Asiedu and Gyimah-Brempong (2008) investigated the impact of investment liberalisation policies on employment levels and investments made by MNCs into Africa. The study used dynamic panel estimation data for 33 African countries from 1984 to 2003. The study reveals a positive relationship between investment liberalisation and investment climate. It was also discovered that investment liberalisation has no direct effect on MNCs employment levels but the impact is indirect, i.e. liberalisation promotes MNCs' investments, which lead to an increase in MNCs' employment levels. Moreover, the study revealed that, by increasing the employment effect of FDI from MNCs and liberalisation policies, poverty can be alleviated in these developing countries.

Abor and Harvey (2008) investigated the nexus of FDI and employment levels in Ghana from 1992-2002. The study employed the 2SLS model framework for empirical analysis. The findings reveal a positive effect of FDI on employment levels in Ghana. Moreover, domestic investment and FDI were both found to react significantly to increase employment levels with a positive relationship between these variables. The implication of this was that a rise in both local investment and FDI result in a rise in employment levels in Ghana.

Massoud (2008) carried out a study that examined the FDI impact on employment levels in Egypt. Massoud argued that FDI has different components in the economy that may have contradicting effects on employment levels. The study used both aggregated and disaggregated FDI; hence the study found a complicated FDI impact on employment levels in Egypt, which also depends on the interaction with other macroeconomic variables. The study found that aggregate FDI has an insignificant effect on labour demand. As a result, FDI has a negative effect on employment levels. On the other hand, Greenfield investments and manufacturing FDI also had an insignificant correlation with the demand for labour, but FDI had a positive effect on employment levels. Mergers and acquisitions, agricultural and services FDI had a negative effect on employment levels.

Bezuidenhout (2009) assessed the dynamics of FDI in the region of southern Africa from 1990-2005. The findings revealed a small negative effect of FDI on GDP. The study suggests that the reason for a negative impact may be the fact that a large amount of FDI is allocated in the primary sector in these selected countries, which may lead to the limitation of technological and knowledge spill-overs to other economic sectors which largely contribute to the economic growth of these countries.

A study carried out by Ashipala (2010) scrutinised the causes of unemployment from 1971-2007 in Namibia. The empirical analysis was conducted through the use of the Engle-Granger causality approach. The findings of the study revealed that a rise in investment results in a significant decrease in the rate of unemployment in the Namibian economy. The empirical results also allude to the importance of increasing the productivity of the country and the fact that wages need to be flexible in order to deal with the high rate of unemployment in the Namibian economy.

Muhammad, Oye and Inuwa (2011) assessed the unemployment effect on the economic growth of Nigeria from 2000 to 2008. The findings of the study demonstrate that a 1% rise in unemployment results in a 0.65% decrease in the Nigerian GDP thus proving a negative effect of unemployment on GDP of the Nigerian economy. Anyanwu (2011) investigated the determinants of FDI inflows into Africa between 1980 and 2007. The empirical findings reveal that the market size and trade openness have a significant positive effect on inward FDI. On the other hand, the study suggested that high financial development has a negative impact on FDI. Furthermore, the study suggested that higher FDI goes where international remittances also go and access to natural resources attracts large FDI inflows in Africa.

Anyanwu (2012) conducted a study on what determines the direction of FDI into African developing economies. The estimation of the results was based on cross-country regressions from 1996 to 2008. The empirical findings of the study indicate that there is a positive effect of market size and trade openness on inward FDI. Agglomeration of natural resources also had a positive effect on inward FDI, while higher financial development has a negative impact on inward FDI. Moreover, the study reveals that major FDI flows tend to follow foreign aid and that natural resource availability plays a huge role in attracting FDI inflows into the economy. A study carried out by Sichei and Kinyondo (2012) assessed the determinants of FDI for 45 African countries from 1980 to 2009. The study used the dynamic panel estimator for empirical analysis of the results. The study's empirical finding identified a number of factors that affect FDI inflow in Africa; these factors include natural resource availability, agglomeration, GDP growth and international agreements on investment. The study also found that the environment across Africa has been conducive enough to attract FDI since the year 2000.

Mpanju (2012) examined the FDI impact on employment levels in Tanzania. The study was conducted using the OLS technique. The empirical result reveals a strong significant positive FDI effect on employment levels, i.e. a rise in FDI inflow lead to a rise in employment levels in Tanzania. Research carried out by Inekwe (2013) investigated the links among FDI, employment and growth in the Nigerian economy between 1990 and 2009. The variable economic growth was used as an endogenous variable and exogenous variables include FDI, employment, capital and domestic investment. The study employed the Johansen VECM approach. The study presented

empirical results that differ across various economic sectors. The empirical findings indicate a positive effect of FDI on economic growth in the services sector while a negative impact of FDI on growth was observed in the manufacturing sector. A significant positive impact of FDI on employment levels was observed in the manufacturing sector while FDI in services sector was found to have a negative relationship with employment levels.

Studies conducted by Salami and Oyewale (2013), and Okoro and Johnson (2014) assessed the link between FDI, employment and economic growth in Nigeria. Salami and Oyewale (2013) claimed that a significant positive impact of FDI on growth was observed in the services sector, while a negative impact of FDI on employment levels and growth was observed in the manufacturing sector of Nigeria. FDI in the manufacturing sector had a positive effect on employment levels while FDI has a negative effect on employment levels in the services sector of Nigeria.

Ugochukwu, Okore and Onoh (2013) assessed the empirical effect of FDI on economic growth from 1981 to 2009 in the Nigerian economy. The study used OLS estimation methods to ascertain the impact of FDI on growth in Nigeria. The study also used the Granger causality technique to determine the causal link between FDI and economic growth in Nigeria. The results indicate a positive but insignificant effect of FDI on economic growth in Nigeria. The interest rate had a positive but insignificant impact on growth as well. On the other hand, exchange rate exhibits a significant positive FDI effect on the economic growth of Nigeria. The study recommends that the government of Nigeria should always try to promote inward FDI by improving regulatory framework and policies, and by encouraging domestic investment in the Nigerian economy.

Onimisi (2014) examined the FDI effect on employment generation in Nigeria from 2002-2012. The variables used in the study include employment, FDI, GDP and nominal interest rate. The empirical findings indicate a negative effect of FDI on employment levels, while GDP and interest rate are positively correlated with the employment levels. However, none of the explanatory variables were found significantly to affect employment levels in Nigeria. The study suggests that a negative effect of FDI on employment levels calls for critical examination of these variables because FDI is recognised to bring about a significant, positive effect on GDP and

therefore it is also expected that FDI will bring a reduction in the rate of unemployment in the country.

Mahembe (2014) assessed the short-term and long-term causality between FDI and economic growth in 15 SADC countries from the period 1980 to 2012. The study used the panel data analysis methods within a VAR framework to ascertain causality between these variables. The results from a panel Granger causality for the low-income countries show no evidence of causality in either direction between the selected variables. However, for the middle-income countries, the evidence was presented for a unidirectional causal flow from GDP to FDI in both the short and long run. The empirical findings of the study suggest that the FDI-led growth hypothesis does not apply to SADC countries. Furthermore, the results imply that it is economic growth that drives FDI inflows into the SADC region, and not vice versa.

Boateng (2014) studied unemployment determinants from 1984 to 2010 in Ghana. The study used the probit regression model for estimation of the results. The study found that a reservation wage has a significant impact on unemployment rate in Ghana. It recommends that a country should formulate policies that encourage FDI directed to agriculture and the manufacturing sector which are both linked to greater employment elasticity of total output.

Mayom (2015) investigated the effect of FDI on labour market measures employing panel data of 48 Sub-Saharan African (SSA) countries during the period 1991-2009. The empirical findings reveal a significant positive impact of FDI on employment, i.e. a rise in FDI inflows lead to higher levels of employment. The study recommends that the governments of sub-Saharan African countries should always try to eradicate poverty and promote employment-creating policies that direct inward FDI into industries where they can significantly reduce poverty and the unemployment rate in these developing nations.

Kariuki (2015) examined factors that influence FDI inflows into African developing countries using annual data for 35 African countries from 1984-2010. The study firstly suggests that the inflows of FDI are important for African developing nations as they promote economic growth and development. The result estimation was obtained using the fixed effects estimation model. The empirical results indicate that a good commodity price index performance, a good performance of stock markets in

developed countries, an increase in the infrastructural development of a country and an increase in trade openness all have a significant positive effect on inward FDI in African countries under consideration.

Most empirical literature presented in the African context, particularly with the main focus on developing countries shows a significant positive impact of inward FDI on employment levels in their respective countries (Adewumi, 2006; Abor and Harvey, 2008; Mpanju 2012 and Tshepo, 2014). All these researchers assessed the nexus between FDI and employment levels in their respective developing African countries and found that FDI reacts significantly to increase the level of employment in their nations. On the other hand, some authors, who include Muhammad, Oye and Inuwa, (2011) and Onimisi, (2014) revealed a negative and insignificant link between FDI and employment levels in their respective African developing countries.

3.4 Empirical Literature from International Studies

The empirical literature conducted in the world arena shows different views from different international researchers. Most of the global empirical literature shows a significant positive effect of FDI on employment levels (Craigwell, 2006; Ajaga and Nunnenkamp, 2008; Vacaflores, 2011 and Xu, 2013). All these researchers examined the FDI impact on employment levels and their findings demonstrated a significant positive relationship between the macroeconomic variables under investigation. In contrast to this, some researchers found an inverse relationship between FDI and employment levels (Jenkins, 2006; Bailey and Driffield, 2007 and Wei, 2013), i.e. FDI had an insignificant increase to the level of employment in their respective countries.

Bond and Reenen (2007) conducted a comparative study about the effect of foreign investment on employment levels using individual MNCs. The study noted the importance of MNCs in developing countries, and concluded with these remarks:

- “MNCs lead to an increase in employment generation and domestic investment in developing countries;”
- “Multinational Corporations’ employment and investment quality is completely different from those of local firms”.

Jenkins (2004) studied the dynamic impact of FDI on employment levels in Vietnam between 1995 and 1999. The results indicated a negative and insignificant FDI impact on employment levels. It was also discovered from the study that even domestic investment does not react significantly to increase employment levels in Vietnam. Moreover, an increase in public investment was also found to have an insignificant effect on employment levels.

Fu and Balasubramanyam (2005) investigated the nexus of FDI and employment levels in China from 1987-1998. The study used a GMM-IV model framework to analyse empirical findings. The findings were that a rise in both domestic investment and FDI brings about a positive impact on employment generation, i.e. FDI reacted significantly to increases in employment levels. An empirical study carried out by Banga (2005) investigated the link between FDI and employment levels from 1991 to 1998 in India. The study applied the GMM – IV model to analyse the empirical results and found no link between FDI and employment levels. The findings show that neither domestic investment nor FDI was found significantly to increase employment levels in India.

Craigwell (2006) studied the dynamic effect of FDI on employment in 20 Caribbean countries from 1990 to 2000. The findings show that domestic investment and FDI both spurs employment levels, i.e. a rise in FDI leads to a rise in employment levels in countries the under investigation. The results also indicate that FDI has the greatest impact in countries with good trade policies and financial development, implying that better returns on FDI are generated in countries with a good economic environment.

Hiratuka (2006) used a panel model to assess the effect of FDI on wages, using data on domestic industrial companies in Brazil from the period 1997 to 2002. The main focus of the study was based on assessing foreign investment on domestic wages. The findings show that expansion of foreign investment results to a positive effect on wages of both 'white-collar' and 'blue-collar' workers leading to other factors that could positively affect employment and education levels. The results suggest an insignificant effect of FDI on blue-collar workers, whereas FDI was found to have a significant and positive impact on wages for white-collar workers. Therefore, the study presented evidence that growth of FDI inflows have a positive effect on domestic wages paid to non-production workers in domestic companies of the same sector.

A study conducted by Seyfried (2007) assessed the nexus between growth and employment levels in USA for the period 1990 to 2006. The variables that were employed in the model include economic growth, employment, capital, labour, technology, investment and education. The study used OLS estimation methods to ascertain employment intensity of economic growth in the economy of the country. The study presented evidence which suggests that nations with high labor force growth rates and relatively large service sectors tend to exhibit higher levels of employment intensity of economic growth in the economy of the country.

Huang and Zhang (2007) investigated the influence of FDI on generating employment in China using a VAR approach. The findings reveal that the employment effect of FDI is not obvious and there is no significant link between FDI and domestic wages. However, there was a significant effect of domestic investment on domestic wages. The researchers concluded that the VAR method produced plausible results for showing a pure employment effect of FDI in the Chinese economy. Bailey and Driffield (2007) studied the dynamic effect of FDI on employment levels in the United Kingdom (UK) between 1984 and 1996. The study used the GMM model framework for estimation purposes. The empirical findings indicate a negative effect of FDI on employment levels, implying that, FDI does not act significantly to increase employment levels in the UK. Moreover, an increase in domestic investment also has an insignificant effect on employment levels in the UK.

A study conducted by Nunnenkamp and Bremont (2007) studied the nexus between FDI and employment levels in Mexico during the period of 1994 to 2006 with data covering 200 manufacturing firms in Mexico. The study used the GMM model framework for empirical analysis of the results. The study revealed a positive FDI impact on employment, i.e. FDI flows react significantly to increase employment levels. Both FDI and domestic investment were found to increase employment levels significantly. The empirical findings of the study were applicable to both white and blue collar workers in the economy of Mexico.

Jayaraman and Singh (2007) scrutinised the dynamic effect of FDI on employment levels in Fiji in the period of 1970 to 2003. The study employed the ARDL approach to analyse the interaction between FDI, employment and GDP. The estimated results reveal a positive impact of FDI on employment levels, i.e. FDI results in a significant increase in employment levels. They also suggest that an increase in aggregate

investment is always expansionary for the economy, while increases in domestic investment lead to a significant improvement in employment levels in the economy. The study recommends that it is important for Fiji to continue with its current proactive investment policies of attracting inward FDI and also ensure a stable political environment in the country.

Wong and Tang (2008) examined the nexus between FDI and employment levels in Singapore in the period between 1997 and 2005. Their study used the VAR–OLS model framework. They discovered no signs of any relationship that may exist between FDI and employment levels. Therefore, FDI does not react significantly to increase employment levels in Singapore. Har (2008) studied FDI's effect on economic growth from 1970-2005 in Malaysia. The study employed the OLS estimation methods for annual time series data. The empirical findings demonstrate sufficient evidence that shows a significant positive impact of FDI inflows on economic growth of Malaysia.

Rizvi and Nishat (2009) assessed the impact of inward FDI on employment for the period of 1985 to 2008 in India, Pakistan and China. The study employed the Pedroni (1998) test for panel co-integration to ascertain the long-run interaction between FDI and employment levels. The variables used in the study were FDI, employment and the GDP for model estimation in the empirical analysis. The empirical results indicate that FDI has no effect on employment levels in the three countries under consideration. The findings show that growth elasticity of employment is extremely low in all three nations; hence, policies that promote employment must be priorities in these countries. The study also recommends that apart from FDI enhancement policies, employment creating policies must be formulated to promote growth and employment levels in these three countries.

A research conducted by Aktar and Ozturk (2009) analysed the FDI effect on employment levels for 2001-2007 period in Turkey using the VAR model. The findings of the study indicate that there is no significant impact of FDI on employment in Turkey. Ismail and Latif (2009) also conducted a study focusing on the interrelationships among FDI, exports, unemployment and economic growth from 2001-2007 in Turkey. The study used a VAR model framework to empirically analyse the short-run interaction between selected macroeconomic variables. The findings indicate no significant impact of FDI on unemployment in Turkey.

Lacovoiu (2009) conducted a study to assess the interaction between net capital investment and unemployment from 2004-2012 in Romania. The results of the study suggest that there has been a reduction in FDI since 2009 due to the global financial crisis that led to a decrease in employment levels and increasing the rate of unemployment in Romania. In a nutshell, the study reveals a negative relationship between net investments and unemployment rate in Romania.

Sahoo (2009) scrutinised the effect of fiscal policy on employment generation between the years 1993 and 2010 in India. The study used a panel data model to ascertain the interaction among selected economic variables. The variables that were employed in the model include government spending as a dependent variable and independent variables of employment, capital, consumption and poverty. The findings of the study indicate that expansionary fiscal policy is an important instrument which enhances employment levels and growth rate in the economy. Moreover, the study suggests that expansionary fiscal policy is also an important instrument in combating poverty and uplifting the standard of living in the economy of India.

Himachalpathy (2010) conducted a comparative study to assess the status of inward FDI into India and China for the period of 1991-2008. The empirical findings suggest economic indicators such as imports, exports, trade openness and GDP are all positively correlated with inward FDI into these two countries. Furthermore, the findings of the study suggest that imports, exports, trade openness and GDP are regarded as the main determinants that attract FDI inflows into these countries more than any other possible determinants in the economy.

Pinn, Ching, and Kogidbounds (2011) examined the interaction between FDI and employment levels in Malaysia from 1970 to 2007. The study employed the ARDL model for estimation procedure. The findings suggest that there is no long-run co-integration between FDI and employment levels because the nature of foreign investment projects is more capital-intensive than labour-intensive.

Faheem, Raza and Shakeel (2011) investigated the main determinants of FDI inflows in China. The results of the study suggest that market size, Chinese economic growth, low labour cost, good infrastructure, trade openness, tax policies and exchange rate are the main determinants of inward FDI into the Chinese economy. A comparative study conducted by Agrawal and Khan (2011) assessed the link between FDI and

growth in India and China for the period of 1993-2009. The study used the OLS methods for carrying out empirical analysis. The results indicate that a 1% rise in FDI lead to a 0.07% increase in the Chinese GDP and 0.02% rise in the GDP of India. The study also suggests that FDI inflows contribute more to China's growth as compared to the economic growth of India.

Balcerzak and Zurek (2011) investigated the impact of FDI on employment in Poland during the period of 1996 to 2009. The study used the VAR-OLS model to analyse the empirical results. The results indicate a positive impact of FDI on employment levels. It was found that both domestic investment and FDI react significantly to increase employment levels in Poland. Vacaflares (2011) scrutinised the nexus between FDI and employment levels in Latin America from 1980 to 2006 using the GMM model. The findings of their study reveal a positive effect of FDI on employment levels in the country. Moreover, an increase in local investment and FDI leads to a significant rise in employment levels of Latin America.

Rankin and Roberts (2011) asserted that unemployment is a structural issue in the economy of South Africa, implying that the issue of unemployment is somehow beyond the direct control of fiscal and monetary authorities. Some of the structural barriers in the South African labour market include changes in production technology, skills shortages, labour union rigidity, tight labour regulation, and barriers that prevent the emergence of small enterprises. Therefore, the path to a long-run reduction of the unemployment rate lies in addressing such critical issues or rigidities in the South African labour market. Hence, it is imperative for the South African government to take into account these barriers in the labour market when formulating policies and allocating financial resources with the aim of creating employment opportunities and prosperous growth in the economy of South Africa.

A research carried out by Kornecki and Ekanayake (2012) investigated factors that affect FDI and employment levels in USA from 1997 to 2007. The study was able to identify several state-specific determinants of FDI that contribute to an increase in employment levels and economic growth. The findings reveal that real wages, infrastructural development, FDI stock and high level of education all have a positive impact on FDI. Conversely, the empirical findings also suggest that GDP growth rate and per capita taxes have an insignificant negative effect on FDI and employment.

A study carried out by Carp (2012) assessed the importance of FDI in the country's economic growth of Romania. The findings revealed that capital flows have a positive impact on growth. Furthermore, the findings suggest that the main channels through which the effects of FDI are transmitted include financial markets, absorptive capacity, human capital and technological advancement in the country. Shaari *et al.* (2012) scrutinized the link between FDI, unemployment and growth from 1980-2010 in Malaysia. The study used the OLS method to assess the relationship between these variables. The study found that a rise in FDI leads to a reduction in unemployment and promotes growth in the economy of Malaysia.

Wei (2013) tested the impact of FDI on employment levels using annual time series data from 1985 to 2011 in China. The findings reveal that there is an insignificant negative effect of FDI on employment creation in the Chinese economy. The results also indicate that the effect of FDI on employment differs across economic sectors. The impact of FDI on employment was found to be positive in the primary sector of the economy. The secondary sector of the economy exhibited an insignificant and negative effect of FDI on employment, although GDP had a strong positive impact on employment levels. FDI inflows were found to be negative and significant in promoting employment creation while GDP had a positive impact on employment levels in the tertiary sector of the economy.

A study carried out by Pattanaika and Nayak (2013) examined the trends of employment intensity growth in India. The study used secondary data from 1961 to 2005, applying the Box-Jenkins ARIMA model for empirical analysis. Employment was used as a dependent variable, while independent variables included capital, labour, and income in their model. The empirical results indicate that India has been experiencing jobless growth since the 1990s due to the inefficiency of manufacturing and service sector in the economy. The study also anticipates that some possible improvement in employment elasticity of secondary sector and tertiary sector will continue to remain a concern for the economic growth. Moreover, the study suggests that a country's dependence on the primary sector will continue to rise and thus resulting to a negative labour productivity in India's economy.

Almfraji and Almsafirc (2013) studied the impact of FDI on growth in Malaysia. The findings reveal that there is significant positive effect of FDI on growth, but in some instances, it is negative or even null. Moreover, within the relationship between these

variables, there are also several other influencing factors such as adequate levels of human capital, well-developed financial markets, complementarity between domestic and foreign investment and the trade openness regimes. Zeb, Qiang and Sharif (2014) investigated the link between FDI and unemployment in Pakistan for the period of 1995-2011. The variables that were employed in the study include corruption, population size and inflation rate. The multiple regression models were estimated to ascertain the significance of each selected macroeconomic variable on unemployment. The findings reveal that FDI inflows have a significant effect in reducing the unemployment rate in the economy of Pakistan.

A comparative study carried out by Mathipurani and Philip (2014) scrutinised the competitive position of India among Brazil, Russia and China in FDI inflows attraction status during the period of 2001 to 2011 in BRIC countries. The study reveals that even though India has better scope in attracting FDI, the volume and growth rate are low as compared to Brazil, Russia and China, while China has out-performed all other countries and Brazil has attracted a good volume of FDI inflows. The study also found that all the four countries under consideration have managed to recover during the period of post-economic crisis but at different speeds and levels.

Bayar (2014) investigated the nexus between unemployment, economic growth, exports and FDI inflows in Turkey from 2000 to 2013. The study employed an ARDL bounds to estimate the short and long-run interaction between these variables. The results reveal a long-run co-integration between unemployment, economic growth, exports and FDI inflows. Furthermore, the empirical results reveal a negative and insignificant link between unemployment, growth and exports, while unemployment and FDI inflows had a positive nexus in the long-run.

Stanković, Kulić, and Primorac (2015) investigated the effect of inward FDI on unemployment during the period of transition in the Republic of Serbia. The findings of the study suggest that Serbia has been able to create the economic environment that enables FDI inflows to take place in order to improve the employment levels in the economy. Moreover, the results also suggest that Serbia has significantly benefited from FDI inflows through technological transfers and competition enhancement in the domestic market of the economy. Khatodia and Dhankar (2016) examined the growth of employment in both public and private sector by foreign capital flows which include FDI, Foreign Portfolio Investment (FPI), External Commercial Borrowings (ECBs), and

NRI Deposits in India from 1991-2012. The empirical findings of the study show a positive and significant impact of foreign capital inflows on the growth of employment levels except for the FPI and NRI deposits in India's economy.

3.5 Conclusion

This chapter of the study has discussed most of the relevant and the recent empirical work in understanding the influence of FDI on domestic employment levels in the South African economy. Empirical findings from prior studies presented in this chapter has revealed mixed and sometimes controversial results with regard to the effect of FDI on employment. There is limited literature from the South African context, and the current study seeks to explore advanced econometric analysis that has not been carried out before in assessing this relationship. The empirical literature presented will make it easier for the researcher to choose appropriate variables required for econometric modelling. The empirical findings from developed and developing countries were equally taken into account in order to gain a robust understanding of interaction among variables under investigation in this particular study.

Finally, this chapter confirms that most developing countries are moving toward promoting policies that encourage FDI inflows in order to improve employment levels and ensure sustainable economic growth, as advocated by many international economists. The empirical work outlined in this chapter is expected to eventually support the empirical model estimation procedure in the following chapter. The empirical evidence presented in the study about the contribution of FDI to employment levels and economic growth takes this summary as a point of departure. The following chapter deals with the discussion of the estimation procedure and methodological framework that will be employed in the estimation process and results analysis in chapter 5 of the study.

Chapter Four: Research Methodology

4.1 Introduction

The primary purpose of Chapter Four is to discuss all relevant estimation techniques and model specifications that will be tested in the estimation process in Chapter 5 of the study. The concept of stationarity, VAR approach, co-integration and VECM analysis will be discussed in detail, which will be computed to estimate the short-run adjustments dynamics and long-run relationships that exist among the selected macroeconomic variables. These include employment, FDI, GDP, inflation, trade openness and unit labour costs. The study analyses this relationship through the use of annual time series data covering the period of 1980 to 2015 exported in eviews 9 statistical software package for the purpose of estimating empirical results. This chapter is separated into six different sections as follows:

Section 4.1 introduces the chapter. Section 4.2 provides a six-variable model specification of the study. This section will also discuss data issues and sources. Lastly, the data transformation and justification of the selected macroeconomic variables that will be used for the estimation process in Chapter 5, and their respective sources, are also discussed in this section.

Section 4.3, subsection 4.3.1 focuses on a detailed discussion of the concept of stationarity in the time series analysis, including the issue of spurious regression, the various units root tests for stationarity, i.e. Dickey-Fuller (DF), Augmented Dickey Fuller (ADF) and Philip Perron (PP) test for stationarity. Subsection 4.3.2 discusses the VAR model approach including its definition, advantages, estimation and identification, error correction modelling in VAR frameworks, and Impulse Response Function (IRF) and variance decomposition in order to identify the surprise shocks among variables in the system. The concept of co-integration analysis is discussed in subsection 4.3.3 including its procedure for co-integration testing. The discussions on ECM and deterministic component in subsection 4.3.4 and 4.3.5, followed by VECM outlined in subsection 4.3.6. Subsection 4.3.7 presents a discussion of single equation methods which include OLS, FMOLS, DOLS and CCR estimation techniques.

Section 4.4 gives the discussion of the regression pathologies of the model diagnostic inspection including serial correlation, functional misspecification, heteroscedasticity

and normality. Section 4.5 forms a discussion on the issues around model stability analysis, before section 4.6 sums up with the conclusion of the entire chapter.

4.2 Model Specifications

The selected macroeconomic variables considered in the specification of the model are backed by both theoretical and empirical evidence provided in chapter 2 and 3, respectively. The study extend the labour demand function as a theoretical justification of the empirical analysis. The neoclassical framework assume that there is a negative relationship between aggregate demand for labour and real wages (labour cost), but there is a positive link between the demand for labour and country's output (GDP). According to the work of Vacaflares (2011) and Chinyelu (2014), the model specification for a demand function can written as follows:

$$EMP = f(LC, GDP, FDI) \quad (4.1)$$

The equation below (4.2) relates the parameters in the regression model, supposing that there is a linear relationship between selected macroeconomic variables. The model specification of the study can be specified in the following the form:

$$EMP_t = \beta_0 + \beta_1 FDI_t + \beta_2 GDP_t + \beta_3 INF_t + \beta_4 TOP_t + \beta_5 LC_t + \varepsilon_t \quad (4.2)$$

Some researchers who have used similar theoretical model frameworks with some of the key variables as of this particular study include Rizvi and Nishat, (2009); Wei, (2013); Habib and Sarwar, (2013); Onimisi, (2014) and Strauss, (2015). Furthermore, equation 4.2 will be transformed into natural logarithmic form in order to achieve the research objectives. Therefore, the above equation (4.2) can be written in natural logarithmic form as follows:

$$\ln EMP_t = \beta_0 + \beta_1 \ln FDI_t + \beta_2 \ln GDP_t + \beta_3 INF_t + \beta_4 TOP_t + \beta_5 \ln LC_t + \varepsilon_t \quad (4.3)$$

Where:

$\Delta \ln EMP_t$ is the natural logarithm of employment at time t ;

$\ln FDI_t$ is the natural logarithm of FDI at time t , which is expected to be positive;

$\ln GDP_t$ is the natural logarithm of GDP at time t , which is also expected to be positive;

INF_t represent inflation rate already in percentage form at time t , expected to be positive;

TOP_t represent trade openness already in percentage form at time t , expected to be positive;

$lnLC_t$ is the natural logarithm of unit labour costs at time t , expected to be negative;

β_0 represent the constant coefficients;

ε_t are error terms.

4.2.1 Model Estimation

This section discusses the estimation techniques to be employed in order to achieve the objectives and address the hypotheses of the study as presented in Chapter One. Equation 4.2 is estimated through the use of the VAR/VECM as the main model, and OLS, FMOLS, DOLS and CCR as supporting and verifying models in order to achieve the study's primary objectives. The short-run relationship existing between FDI and employment levels will be estimated through the use of the following VAR(p) model:

$$lnY_t = \mu + \sum_{i=1}^p \Gamma_i lnY_{t-i} + \varepsilon_t \quad (4.4)$$

The above equation (4.4) demonstrates a VAR(p), where $Y_t = EMP_t, FDI_t, GDP_t, INF_t, TOP_t, LC_t$ is a (6×1) column vector of six endogenous variables, i.e. employment, FDI, GDP, inflation, trade openness and unit labour costs. μ denotes a (6×1) vector of the constants, Γ_i is a (6×6) matrix of autoregressive coefficients of regressors, p is the VAR order and the ε_t vector comprise composites of random shocks in the model. The IRF and variance decomposition is employed in order to identify the shocks between employment, FDI, GDP, inflation, trade openness and unit labour costs. It is imperative to understand that the VAR(p) model of this form can be estimated only if all variables are stationary, i.e., I(0).

However, if all variables are I(1) and co-integrated, the above VAR(p) equation (4.4) needs to be converted and further estimated through the use of a Johansen VECM methodology. The VECM is an appropriate model that captures the short-run dynamics and long-run relationships between the variables in the system (Brooks, 2013). In this regard, the VECM captures the long-run co-integrating relationship that exists between employment, FDI, GDP, inflation, trade openness and unit labour costs, and the short-run relationships consistent with those of a long-run. The VECM model specification is presented in the following form:

$$\Delta \ln Y_t = \mu + \Pi \ln Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta \ln Y_{t-i} + \varepsilon_t \quad (4.5)$$

From the VECM equation (4.5), Δ is the first difference parameter, Y_t is a $k \times 1$ vector for all independent variables, μ is the intercept coefficient, Π is a $k \times k$ matrix of a long-run multiplier and Γ_i are $k \times k$ coefficient matrices explaining the dynamic effects in the short-run. The notation of p is the VAR order. The lag order is reduced to $p - 1$ because the VECM representation is in first differences. ε_t is a vector of innovations.

As previously stated, single and co-integrating regression models will be used as a supporting and confirmatory model to corroborate results obtained from the VAR/VECM model. Gujarati (2004) asserts that a time lag exists between some macroeconomic variables. Economic indicators forecast that it takes about one to six years for FDI projects to exert any significant effects on the economy of the country. Hence, it is important to estimate single-equation models in order to account for this time lag on the selected macroeconomic variables. All single-equation methods (OLS, FMOLS, DOLS and CCR) will follow the model specification in equation (4.3).

4.2.2 Data Issues and Sources

The study uses annual time series data running from the period of 1980-2015, thus giving us 36 observations, with the following variables: employment, FDI, GDP, inflation, trade openness and unit labour costs. All variables in monetary values are measured in terms of domestic currency, i.e. South African Rand. The time series data of all variables are extracted from two sources, i.e. the South African Reserve Bank (SARB) website (www.resbank.co.za) and Statistics South Africa (StasSA) database website (<http://www.statssa.co.za>) through access to their online downloading facilities using the Excel format. The study uses eviews9 statistical software for the purpose of analysing data, and empirical estimation and analysis.

4.2.3 Justification of the Selected Variables

The following macroeconomic variables are used in the study to analyse the contribution of FDI to employment levels in the South African economy, i.e. employment, FDI, GDP, inflation, trade openness and unit labour costs. The motivation behind the selection of these macroeconomic variables is purely supported by both the theoretical and empirical background contained in chapter 2 and 3 of the

study, respectively. Employment (EMP) is measured as total employment in the non-agricultural sector (KBP7009J). The constant factor (β_0) represents unobserved effects in the model. FDI is measured by the foreign assets: total direct investment as a proxy (KBP5600J). GDP is measured as a proxy of the real GDP at constant prices (KBP6006Y). The notion behind this is that, as the amount of output (GDP) in production increases, employment is expected to increase as well due to a rise in output. The data series for inflation rate (INF) is unavailable from the SARB, hence, it is computed from the percentage of consumer price index (CPI) extracted from StatsSA (see equation 4.7, below). Trade openness (TOP) is computed as the ratio of net export to GDP and will be calculated in this regard, i.e. exports + imports / GDP (KBP6013D + KBP6014D / KBP6006Y). The unit labour costs (LC) will be measured by the nominal unit labour costs in the non-agricultural sectors as a proxy (KBP7015J). As previously mentioned, all variables were selected on values that are seasonally adjusted. A ε_t is a white noise and stochastic error term representing the variable defining the probabilistic properties.

4.2.4 Data Transformation

This section covers the transformation of the variables into the natural logarithm. The four variables, including employment, FDI, GDP and unit labour costs, are transformed into the logarithmic form in order to convert them from nominal variables to real variables. The other two variables, inflation rate and trade openness, are not transformed into the logarithmic form as they already exist in the percentage form. Hence, it is unnecessary to transform these two variables into the logarithmic form, since their coefficient values are automatically interpreted as elasticity values. Thereafter, the logarithmic transformations are done in eviews9 as for the preparations for empirical estimation and analysis of the results.

4.2.4.1 Natural Logarithmic Transformation

It is important to transform macroeconomic variables with a time series data into natural logarithm form due to the fact that non-transformed data usually tends to vacillate upward and downward, and unit root tests often diagnose these time series as non-stationary. Furthermore, the notion behind data transformation is that it becomes easy interpret coefficients values as elasticity values. To a certain extent, the transformation of data has the element of smoothing data series and it has the

ability of removing seasonal trends for the effect of other influences to be observed in the process of generating data. Transforming these four variable data series into natural logarithm form means that the series (Y_t) remain roughly constant thus their percentage growth may be considered as follows:

$$(Y_t - Y_{t-1})/Y_{t-1} \quad (4.6)$$

4.2.5 Computation of Trade Openness and Inflation

As previously mentioned that trade openness (TOP) in the study computed as the ratio of net export to GDP and it will be calculated as such. The calculation of trade openness implies that there must data available for export and import in order to calculate net export. Thereafter, the net export is divided by the GDP value in order to get trade openness. Hence, the practical procedure for calculating trade openness is presented in the following formulae:

$$TOP = \frac{EXPORTS + IMPORTS}{GDP} \quad (4.7)$$

Where, TOP represents trade openness, equal to the value of exports plus imports value divided by the value of the GDP.

$$Inflation = \frac{CPI_{current\ year} - CPI_{base\ year}}{CPI_{base\ year}} \times 100 \quad (4.8)$$

As mentioned earlier, inflation data was computed using CPI data series extracted from the StatsSA database website due to insufficient data of inflation data (2002-2015, while the study uses data series from 1980-2015) from the SARB website. Hence, the computation of data series for inflation rate was carried out using data for CPI following equation 4.8 above.

Figure 4.1: List of Variables

| Variables | Proxy of the Variables | Unit of Measurement | Data Source |
|---------------------------------|---|----------------------------|-----------------------|
| Employment (EMP) | Total employment in the non-agricultural sectors | Index | KBP7009J |
| Foreign Direct Investment (FDI) | Foreign Assets: Total direct investment | R Millions | KBP5600J |
| Gross Domestic Products (GDP) | Gross domestic product at constant prices (GDP) | R Millions | KBP6006Y |
| Exports | Exports of goods & services | R Millions | KBP6013D |
| Imports | Imports of goods & services | R Millions | KBP6014D |
| Trade openness (TOP) | Net exports to GDP (Net export/GDP) | Percentage | (KBP6013D & KBP6014D) |
| Unit labour costs (LC) | Nominal unit labour costs in non-agricultural sectors | Index | KBP7015J |
| Inflation rates (INF) | Inflation rate (%) | Percentage | STATSSA |

Source: Generated by the researcher, SARB & StatsSA Data.

4.3 Estimation Procedure

This section deals with the discussion of the estimation procedure that will be undertaken in Chapter Five of the study. The procedure of running both VAR/VECM and single-equation models (OLS, FMOLS, DOLS and CCR) is discussed in order to conduct, estimate and produce accurate and reliable empirical results in the following chapter.

4.3.1 Stationarity in the Time Series

Stationary time series data are those drawn from time series whose basic properties don't change over time. In contrast, a non-stationary time series has some sort of upward or downward trend. Most of the macroeconomic time series exhibit random

walk behaviour or trends, and therefore are said to be non-stationary. A random walk is when the current value of a variable is made of its past value and an error term. For example, $X_t = X_{t-1} + \varepsilon_t$, where current value of variable X_t is composed of its past value of X_{t-1} and an error term ε_t with zero mean and one variance. A stationary time series data is ideal to use because it is easily predictable since its statistical properties will be almost the same in the future as those of the past. It is imperative to use stationary data in order to obtain meaningful and reliable statistics such as means, variances and correlations among variables. Stationarity enables the researcher to understand some of the useful description of future behaviour of variables in the time series. According to the work of Dickey and Fuller (1979), using non-stationary data may result to spurious results from estimated regression models.

A time series is considered as stationary if the mean, variance and covariance remains unchanged over time. These stationarity conditions can be summarised as follows:

- i) $E(X_t) = \text{Constant}$
- ii) $\text{Var}(X_t) = \text{Constant}$
- iii) $\text{Cov}(X_t, X_{t+k}) = \text{Constant}$ for all t and all $k \neq 0$.

If a time series fails to satisfy these conditions, then it is considered as being non-stationary. Generally, a non-stationary time series tends to have different mean values at different points in time. A strict stationarity is the strongest form of stationarity, it simply means that the joint statistical distribution of any collection of the time series variates never depends on time. So, the mean, variance and any moment of any variate are the same whichever variate you choose (Nason, 2013). On the other hand, a weak stationary or wide-sense stationary (WSS) or second-order stationary is one with a constant mean and its auto-covariance depends on lags, i.e. $E[Y_t] = \mu$, and $\text{cov}[Y_{(t)}, Y_{(t+k)}] = \alpha(k)$. WSS random processes only require that first moment and auto-covariance does not vary with respect to time. However, if $Y_{(t1)}, Y_{(t2)}, \dots, Y_{(tn)}$ follows a multivariate normal distribution, then these two stationarity concepts, i.e. (strict and weak stationarity) are equivalent in this regard (Maddala, 2001).

Through visual inspection, a strict or weak trend stationarity can be easily observed when the time series data is demonstrated in the form of a graphical presentation. More often, many economic variables in a real time series are just not stationary, i.e.

time series often display trends or seasonal changes in variance. Therefore, statisticians and econometricians have developed a second armoury of techniques that can manipulate time series to become stationary such as differencing the variables, logarithmic transformations of variables or square roots of the variables. After data manipulation, then the series can be treated as stationary and standard methods may be used for empirical estimation and analysis (Nason, 2013).

4.3.1.1 Transforming Non-stationarity into Stationary Time Series

Converting time series data into first differences is usually enough to transform a non-stationary data series into a stationary one, but it is also a good habit to test for Y_t just to make sure. Converting the level form of variable Y_t can help to make this variable (Y_t) stationary, i.e. $\Delta Y_t = Y_t - Y_{t-1}$. This variable is now stationary because it is equal to the classical disturbance term. Hence, it has a zero mean and a constant variance and a stationary covariance ($\text{cov } Y_t, Y_{t-1}$). Moreover, the first difference of a random-walk process is a stationary and integrated of order one, i.e., $I(1)$.

The results of stationarity are usually displayed by eviews' software, showing whether a series becomes stationary at first differencing or not, based on the t-statistics. If the series is not stationary at first differencing, one can proceed to differencing the series for the second time, (i.e., $Y_t \sim I(2)$). However, this analysis is not expected to go this far because most macroeconomic time series data are usually $I(1)$. Another alternative method of transforming non-stationary data into a stationary one is to detrend the time series that exhibits trends. The trend variable (t) is usually included in such series to avoid the problem of spurious regressions. This process is called the trend stationary process (TSP). According to Nelson and Plosser (1982), the other way of transforming non-stationarity data series into a stationary one is through the inclusion of a deterministic trend or time into the regression model.

4.3.1.2 Avoiding Spurious Regressions

The problem of spurious regression refers to the existence of a strong relationship between two or more variables caused by a statistical fluke or by the nature of the specification of the variables, not by a real underlying causal relationship between tested variables. If one estimates a regression in which the dependent variable is spuriously correlated with the independent variables, the results will be spurious regressions. Hence, t-scores and overall fit of the model (R^2) yielding results with no

economic logic, and therefore such spurious regressions are likely to be overstated and untrustworthy.

Spurious regression is a misleading empirical finding because it reflects a false relationship between the selected macroeconomic variables employed in the model. Before conducting any empirical estimation, it is important to conduct a preliminary examination of the data in order to understand clearly the underlying data properties for application of the relevant and suitable methodological framework. It is also important because it enables the researcher to choose the accurate model framework and evade the problem of spurious regressions.

4.3.1.3 Preliminary Testing (Unit Roots and Other tests)

As previously mentioned, it is highly essential to examine the presence of the unit root before any model specification in order to accurately specify and estimate the suitable model framework. The unit root tests are conducted on individual variables separately; hence, these tests examine no relationships between the variables under consideration. This section will be discussing the various unit root tests that will be used as preliminary tests of the time series before model specifications of the study.

I. Dickey-Fuller (DF) Tests

The Dickey Fuller test determines whether there is a presence of a unit root in an autoregressive model.

Consider an AR(1) model: $Y_t = \rho Y_{t-1} + \mu_t$ (4.9)

Y_t is the independent variable, ρ is a coefficient, t represents time and μ_t represents innovations. There is a unit root if $Y_t = 1$, hence, the model is non-stationary. Thus, the model can be represented as follows: $\Delta Y_t = (\rho - 1)Y_{t-1} + \mu_t = \delta Y_{t-1} + \mu_t$. This model can be tested for the presence of a unit root which is equivalent to testing $\delta = 0$ (where $\delta = \rho - 1$). This test is unable to use t-statistics and critical values since it is conducted based on the residuals. Hence, this t-statistic has a specific distribution that is known as the Dickey-Fuller table. MacKinnon (1991) provides more appropriate critical values as an alternative to the DF critical statistics, which is often used in most econometric models. However, the eviews 9 software package will automatically generate the MacKinnon critical values that will be used in this study.

II. Augmented Dickey- Fuller (ADF) Tests

Dickey and Fuller (1981) developed a modifications of the DF tests when ε_t is not white noise. Dickey and Fuller (1979, 1981) extended the DF test procedure suggesting an augmented version which includes extra lagged terms of the dependent variables in order to remove serial correlation in a model. The ADF test is more suitable for large and complicated time series data. The ADF test can be comparable to a simple DF test except that the ADF adds an unknown number of lagged endogenous variables in its first differences to capture possible autocorrelation in the error term (μ_t) (Harris, 1995). The ADF equation can be presented in the following form:

$$\Delta X_t = \mu + a_2 t + \gamma X_{t-1} + \sum_{i=1}^p \beta_i \Delta X_{t-p+1} + \varepsilon_t \quad (4.10)$$

where $\Delta X_{t-1} = (X_{t-1} - X_{t-2})$, $\Delta X_{t-2} = (X_{t-2} - x_{t-3}) \dots \dots \Delta X_{t-p+1} = (X_{t-p+1} - p)$. In some instances, one may use n lagged difference terms, the number of which are empirically determined by either AIC or SBC. The reasons for including as many lagged terms as possible is to ensure that the error term (ε_t) in the ADF test becomes white noise (i.e., they are serially uncorrelated). Importantly, the usual Dickey Fuller tau statistics is also applicable to ADF as well, and the testing hypothesis still remains the same. Therefore, if the estimated t-statistics is a high negative number, then the correspondence time series will be stationary.

III. The Phillips-Perron (PP) Test

Phillips and Perron (1988) argued that the ADF test is not good enough to test for the presence of the unit root in the data series. Hence they suggested a non-parametric alternative unit root test, known as Z_α and Z_t tests (or PP tests). The advantage of Z-statistics is that it eliminates useless parameters when errors are not normally distributed. This test works best to unspecified serial correlation in the model. The PP equation can be presented in the following form:

$$\Delta X_t = \mu + \sigma X_{t-1} + \varepsilon_t \quad (4.11)$$

The PP test makes a correction of the coefficients (σ) in order to account for the correlation in the error term (ε_t). The asymptotic distribution of the PP t-statistics is the same with those of the ADF t-statistics, and thus the MacKinnon (1991) critical values are also applicable. This is computed by eviews9 software in the same way as with DF and ADF tests. These unit root tests can be conducted using a constant, constant and trend or neither (none) of the two in the regression model. Moreover, this particular study will use the ADF and PP test to ascertain stationarity and integration properties of each variable. It is important to note that when conducting these unit root tests, each variable is tested separately and in isolation from other variables.

4.3.1.4 Complementary (Informal) Unit Root Testing

There are other alternative approaches to testing the presence of a unit root in the data series. Some of the alternative approaches include:

a) Graphical Analysis or Visual Inspection

Graphical analysis of data involves observing the tabulated time series data with no inference on it. Through graphical demonstration of the data series, a reasonable conclusion can be drawn if the data series is stationary or nonstationary; this process will be executed using graphical plots in both levels form and first difference of variables.

b) Correlograms

A correlogram is a diagram used for inspecting a series visually, which involves plotting the coefficients of serial correlation over the estimated time period. The correlogram diagram is examined on the basis of how rapidly does the function of serial correlation declines as the lag length increases.

4.3.2 The Vector Autoregressive (VAR) Approach Analysis

The VAR models have become increasingly popular in analysing macroeconomic variables through econometrics models in the modern economy because of its ability to handle multi-equation models. The VAR approach is considered the best method for the empirical analysis of this study because it enables the researcher to analyse the interrelationships among key macroeconomic variables employed in the study. Hence, the VAR models are estimated in order to provide the empirical evidence on

the response of selected macroeconomic variables to various exogenous impulses to discriminate between alternative theoretical models that exist in the economic literature related to the study. The VAR model is particularly used to ascertain the short-run relationship that exists between the variables in the system. The researcher considers this model to be an ideal one to apply, since all the selected macroeconomic variables are stationary and integrated of the same order, i.e. I(1).

This model framework provides a systematic way of capturing rich dynamics in multiple data series. All the variables are treated symmetrically in the VAR model where each variable explains its evolution based on its own lags and the lags of all the other variables. The VAR model discussion in this section is extracted from Enders (2010), and Asteriou and Hall (2016). Enders (2010) asserts that a VAR model consists of two stationary variables, i.e. Y_t and X_t , where Y_t is affected by current and past values of X_t , concurrently, and X_t is affected by current and past values of Y_t . Hence, the equation of a bivariate model can be presented in the following form:

$$Y_t = \beta_{10} - \beta_{12}X_t + \gamma_{11}Y_{t-1} + \gamma_{12}X_{t-1} + \varepsilon_{Yt} \quad (4.12)$$

$$X_t = \beta_{20} - \beta_{21}Y_t + \gamma_{21}Y_{t-1} + \gamma_{22}X_{t-1} + \varepsilon_{Xt} \quad (4.13)$$

Where Y_t and X_t are stationary variables and ε_{Yt} and ε_{Xt} are uncorrelated white noise terms. The above equations (4.12 and 4.13) are called structural VAR equations as Y_t and X_t have a simultaneous effects on each other, respectively, as given by $-\beta_{12}$ and $-\beta_{21}$ (Asteriou and Hall, 2016). The matrix algebra of equations (4.12) and (4.13) can be presented in the following form:

$$\begin{bmatrix} 1 & \beta_{12} \\ \beta_{21} & 1 \end{bmatrix} \begin{bmatrix} Y_t \\ X_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ X_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{Yt} \\ \varepsilon_{Xt} \end{bmatrix} \quad (4.14)$$

or:

$$\mathbf{Bz}_t = \mathbf{\Gamma}_0 + \mathbf{\Gamma}_1z_{t-1} + \varepsilon_t \quad (4.15)$$

The above VAR model (equation 4.15) cannot be estimated directly since X_t is correlated with the error term ε_{Yt} and Y_t is correlated with the error term ε_{Xt} . A restriction must be imposed in order to estimate equation (4.12) and (4.13) because Y_t and X_t are correlated with their respective errors, i.e. ε_{Yt} and ε_{Xt} . Hence, they do not meet the standard requirement (Gauss-Markov conditions) that regressors must not be correlated with the error terms. A common practice in identifying the restrictions is

to apply a recursive VAR system as proposed by Sims (1980). Sims (1980) suggested that if a restriction stating that $\beta_{21} = 0$ is imposed, implying that Y_t does not have a concurrent effect on X_t , β^{-1} , then:

$$\beta^{-1} = \begin{bmatrix} 1 & -\beta_{12} \\ 0 & 1 \end{bmatrix} \quad (4.16)$$

Pre-multiplying the original VAR by β^{-1} yields:

$$\begin{bmatrix} Y_t \\ X_t \end{bmatrix} = \begin{bmatrix} \beta_{10} - \beta_{12}\beta_{20} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} - \beta_{12}\gamma_{21} & \gamma_{12} - \beta_{12}\gamma_{22} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ X_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{Yt} - \beta_{12}\varepsilon_{Xt} \\ \varepsilon_{Xt} \end{bmatrix} \quad (4.17)$$

Thus, estimating the above equation (4.17) using the OLS gives us:

$$Y_t = a_{10} + a_{11}Y_{t-1} + a_{12}X_{t-1} + \varepsilon_{1t} \quad (4.18)$$

$$X_t = a_{20} + a_{21}Y_{t-1} + a_{22}X_{t-1} + \varepsilon_{2t} \quad (4.19)$$

where $a_{10} = \beta_{10} - \beta_{12}\beta_{20}$; $a_{11} = \gamma_{11} - \beta_{12}\gamma_{21}$; $a_{12} = \gamma_{12} - \beta_{12}\gamma_{22}$; $a_{20} = \beta_{20}$; $a_{21} = \gamma_{21}$; $a_{22} = \gamma_{22}$. The restriction of $\beta_{21} = 0$ in equation (4.16) allows the shocks of both ε_{Yt} and ε_{Xt} simultaneously to affect Y_t , but only ε_{Xt} shocks affect the contemporaneous value of X_t .

This restriction of a VAR model assumes that Y_t has a contemporaneous effect on X_t but that X_t only affects the Y_t sequence with one period lag. Furthermore, the error terms ε_{Yt} and ε_{Xt} affect the contemporaneous values of Y_t , but only ε_{Xt} shocks affect the contemporaneous value of X_t . This kind of a restriction can be relevant and applied in a particular practical economic model. When one variable is restricted in the case of a bivariate model (equation 4.12 and 4.13), the system is considered to be exactly identified. Hence, exact identification requires that $(n^2 - n)/2$ restrictions be placed on the relationship between the regression residuals and the structural innovations (Enders, 2010). This means decomposing the residuals in a triangular fashion known as Cholesky decomposition. If we therefore apply the Cholesky decomposition and assume that Y_t does not have a contemporaneous effect on X_t , then $\beta_{12} = 0$. Hence, the error structure becomes a lower triangular.

Therefore, the ε_{Yt} shock does not affect X_t directly but it affects it indirectly through its lagged effect in the VAR model. It therefore depends on individual choice as to which of the decomposition is most appropriate, based on the assumption that one variable has no contemporaneous effect on the other, i.e., either to put a restriction on

that $\beta_{12} = 0$ or $\beta_{21} = 0$. For example, someone may assume that the FDI performance does not have immediate effects on the employment levels or on growth in the South African economy. Importantly, the ordering of variables in a VAR equation assumes that the first variable responds to the shock of itself. The second variable responds to the shocks of the first variable and its own shock. The last variable in the equation responds contemporaneously to the shocks of all other variables in the system as well as the shock of itself (Asteriou and Hall, 2016). The study uses VAR lag order selection criteria to determine the appropriate VAR lag length. Hence, the study utilises the unrestricted VAR in order to analyse the short-run dynamic interactions between employment levels, FDI, GDP, inflation, trade openness and unit labour costs. A VAR model specification is presented in the following form:

$$y_t = \mu + \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + e_t \quad (4.20)$$

The above equation (4.20) demonstrates a VAR model, where $Y_t = EMP_t, FDI_t, GDP_t, INF_t, TOP_t, LC_t$ is a (6×1) column vector, μ denotes a (6×1) vector of constants, Γ_1 a (6×6) matrix of autoregressive coefficients, and the e_t vector comprises composites of random shocks in the system. For the purpose of the study, the above VAR equation will be converted into a VECM in order to estimate Johansen's co-integration methodology to analyse the co-integrating relationship among variables in the system. Brooks (2013) asserted that the VECM is an appropriate model that captures the short run dynamics and long run relationships among selected variables. Hence, the long-run relationship that may exist between employment, FDI, GDP, inflation, trade openness and unit labour costs, and the short-run dynamic adjustments consistent with the long-run equilibrium relationship will be captured through the use of the VECM method.

4.3.2.1 The VAR Model Estimation and Identification

The main aim of the VAR estimation and identification is to see how a structural innovation (ε_μ) affects the independent variable in the regression model. The VAR model estimation does not require much strong identification assumptions; however, some of the most useful components and applications of the VAR model estimates, such as computing the IRF and variance decompositions, require identification of restrictions. These restrictions are based on the notion of an assumption about the

dynamic relationship between a pair of variables, for example, the assumption that variable X affects Y only with a lag, or that X does not affect Y in the long-run.

The VAR approach has three varieties, i.e. structural VAR, reduced-form and recursive VAR. These three forms of a VAR approach have a common goal of solving the problem of identification. A structural VAR uses economic theory to ascertain contemporaneous economic relationships that exists between economic variables. Structural VAR is more useful for separating out the insignificant effects of economically unrelated variables in the VAR model. For example, the oil price shocks cannot lead to a change in consumer preferences towards their clothing style. Hence, these two factors are expected to be statistically independent. Therefore, the structural VAR is considered to be superior to a recursive VAR model. As previously mentioned in subsection 4.2.2, the Structural VAR (SVAR) can be presented in the following form (similar to equation 4.15):

$$\mathbf{Bz}_t = \mathbf{\Gamma}_0 + \mathbf{\Gamma}_1 z_{t-1} + \boldsymbol{\varepsilon}_t \quad (4.21)$$

On the other hand, a recursive VAR attempts to identify the structure of the model by constructing the error terms that are uncorrelated with errors in the preceding equations. A recursive VAR assumes that the SVAR yields inconsistent coefficients because of the parameter identification problem. Such a problem can be resolved by the estimation of a reduced-form of VAR. A VAR reduced-form expresses each variable in the model as a linear function of its own past values and past values of all other variables in the system. If the variables are correlated with one another, than the error terms will also be correlated in a reduced form (Asteriou and Hall, 2016). In order to transform the structural VAR into a VAR in standard-form or unstructured VAR, we need to multiply equation (4.21) by inverse (B^{-1}): $B^{-1}Bz_t = B^{-1}\Gamma_0 + B^{-1}\Gamma_1 z_{t-1} + B^{-1}\boldsymbol{\varepsilon}_t$, thus giving us:

$$Z_t = A_0 + A_1 Z_{t-1} + \boldsymbol{\varepsilon}_t \quad (4.22)$$

4.3.2.2 Impulse Response Function (IRF)

Since the study uses the VAR system, the IRF will be used to graphically assess the short-run reaction of employment levels to FDI. IRF helps to examine the response to different kinds of shocks of variables in the economy. The IRF shows the impacts of the shocks on the adjustment path of the variables in the model. The IRF traces the responsiveness of endogenous variables to the shocks of each variable in the system.

Enders (2010) asserted that IRF shows the path in which variables diverge and converge to the equilibrium point within a specific period of time as particular shocks take place in the economy. Hence, the study puts more emphasis on the responsiveness of employment to shocks in FDI since this study is mainly interested in investigating the responsiveness of employment levels to shocks in FDI. The impulse responses and variance decompositions are very important in examining how the shocks to economic variables reverberate through a system. The moving average presentation of the mean values of Y_t and X_t respectively, in terms of ε_{Yt} and ε_{Xt} sequences is presented in the following form:

$$\begin{bmatrix} Y_t \\ X_t \end{bmatrix} = \begin{bmatrix} \bar{Y}_t \\ \bar{X}_t \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_{1t-1} \\ \varepsilon_{2t-1} \end{bmatrix} \quad (4.23)$$

The above equation shows composite errors consisting of the structural innovations. In this regard, the IRF consists of the plots of the effect of ε_t on current and all future Y and X , they show how Y_t or X_t react to the different shocks. If we apply the Cholesky decomposition as the restriction on the VAR model to identify the impulse responses and assume that variable Y has no contemporaneous effect on X , then $\beta_{12} = 0$. Then the error structure becomes lower triangular:

$$\begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} = \begin{bmatrix} 1 & -\beta_{12} \\ 0 & 1 \end{bmatrix} \begin{bmatrix} e_{Yt} \\ e_{Xt} \end{bmatrix} \quad (4.24)$$

The ε_Y shock does not affect X directly but it affects it indirectly through its lagged effect in VAR model. In summary, the IRF is a practical way of representing the current and future behaviour of Y_t and X_t series overtime in response to the various economic shocks. However there are some critiques around IRF in application which include:

- IRF may be sensitive to the ordering variables.
- Omitting important variables in the IRF may lead to serious distortions and produce empirical results that are untrustworthy.

4.3.2.3 Variance Decomposition

As previously explained, the variance decompositions tells how much of a change in a variable is due to its own shock and how much is due to the shocks of other variables in the system. It examines how important a component of each shock is for the overall variance of each variable over time. Seymen (2008) asserted that variance

decompositions are normally used by many economists in the context of a VAR model to assess the driving forces of the business cycles in the economy. The variance decomposition is computed based on the moving average representation of a VAR(p) process.

For the purpose of this study, the variance decomposition enables the researcher to interpret the VAR model in assessing the contribution of each variable's forecast errors, explained by its own shocks and the shocks of other variables in the model. Enders (2010) asserted that it is important to understand properties of forecast errors in estimating and explaining the interactions between variables in the system. Hence, the study uses the variance decomposition to assess the reaction of employment levels to FDI. Suppose that the matrix coefficients of A_0 and A_1 in equation (4.21) are known and the researcher wants to forecast the value of Z_{t+1} conditional on the identified value of Z_t . The estimation of variance decomposition can be presented as follows:

$$E_t Z_{t+1} = A_0 + A_1 Z_t \quad (4.25)$$

From the above equation (4.23), a forecast error of a one-step period ahead is given by $Z_{t+1} - E_t Z_{t+1} = \varepsilon_{t+1}$. As previously mentioned, the main purpose of estimating the forecasts error variance decomposition is to show the contribution of each endogenous variable due to its own shocks and those of other variables in the VAR model. Hence, this study will examine how FDI impacts employment levels in the South African economy through the use of the variance decomposition mechanism.

4.3.2.4 VAR Model Specification for the South African Economy

This sub-section discusses the VAR model that will be practically estimated in the empirical analysis of the study in Chapter 5. The empirical analysis of the study will be carried out using the unrestricted VAR model that was proposed by Sims (1980). There are a limited number of researchers who have used the VAR model to analyse the FDI effect on employment levels in the South African perspective. Some of the researchers include Strauss (2015), who investigated at the nexus between FDI, absorptive capacity and economic growth, from the period of 1994-2013, employing a VAR approach.

A study carried out by Tshepo (2014) also assessed the impact of FDI on economic growth and employment in South Africa using a VAR model. However, there is a vast

empirical literature that investigates the impact of FDI on employment levels in international literature. To mention a few, Adewumi (2006), Craigwell (2006), Xu (2013), Wei (2013), and Onimisi (2014) assessed the impact of FDI on employment and economic growth in their respective nations and their findings varied from one study to the other. Therefore, this particular study is conducted in order to fill the gap in economic literature from the South African macroeconomic viewpoint. The VAR model equation that represents the South African economy is specified in the following form, similar to model specification in equation (4.4):

$$\ln Y_t = \mu + \sum_{i=1}^p \Gamma_i \ln Y_{t-i} + \varepsilon_t \quad (4.26)$$

The above VAR model equation represents the South African economy, showing the relationship between the endogenous variables in the system which include employment, FDI, GDP, inflation, trade openness and unit labour costs. These endogenous variables can be shown in the form of vector Y_t :

$$Y_t = (EMP \ FDI \ GDP \ INF \ TOP \ LC) \quad (4.27)$$

where EMP represents employment levels as measured by total employment in the non-agricultural sector as a proxy. FDI stands for foreign direct investment as measured by foreign assets: total direct investment. GDP stands for Gross Domestic Product as a proxy of the real GDP at constant prices seasonally adjusted. INF represents inflation using CPI as a proxy. TOP represents trade openness, which is computed as the ratio of net exports to GDP. Lastly, LC stands for unit labour costs, as measured by the nominal unit labour costs in the non-agricultural sectors as a proxy. The statistical figures of these proxies, as measures of the selected macroeconomic variables, are extracted from the SARB and StatsSA database website at their seasonally adjusted values.

4.3.2.5 Model Selection Criteria in a VAR Model

There are various model selection criteria that are available to estimate the best VAR model under different circumstances. Some of the criteria that are applicable to the estimation procedure of the VAR model order selection that are clearly discussed in the study include Akaike's Information Criterion (AIC), Schwarz's Bayesian Criterion

(SBC) and the Hannan-Quinn Criterion (HQN). Some of the model selection criteria that are applicable to the study are discussed below.

I. Akaike's Information Criterion (AIC)

The AIC estimates the quality of each model relative to each of the other models. The AIC focuses on the trade-off between the goodness of fit and the complexity of the model. The AIC tells us nothing about the quality of the model in an absolute sense. The major disadvantage of the AIC is that if the model fits poorly, the AIC does not give any signal warning about the poor fitness of the model. Enders (2010) suggests that AIC allows the addition of parameters up to the point where marginal cost of a variable equals its marginal benefit. Hence, changing the value of AIC entails the cost and a benefit. The benefit of adding the parameter is an increase in the value of the sum of squared residuals. Conversely, its cost is the reduction in the degrees of freedom and an increase in the parameter uncertainty in the model (Gujarati and Porter, 2009 and Enders, 2010). The equation of the AIC can be written in the following form:

$$AIC_l = \log(\sigma^2) + \frac{2p}{n} \quad (4.28)$$

II. The Schwarz Bayesian Criterion (SBC)

The SBC is a model selection criterion for a finite set of models; the model with the lowest SBC is usually a preferable model among others. The SBC is closely related to the AIC. Both the SBC and the AIC introduce a penalty term to the number of parameters; however, the penalty factor for SBC is usually larger than the one for the AIC. According to Asteriou and Hall (2016), the SBC penalises more for model complexity than all other selection criteria. The SBC can be written as follows:

$$lnSBC = \frac{k}{n} ln n + ln\left(\frac{RSS}{n}\right) \quad (4.29)$$

where $\left(\frac{k}{n} ln n\right)$ represents the penalty term. Moreover, SBC has the ability to select a more parsimonious model than AIC. The major advantage of SBC is that it is superior, in a large dataset, to the AIC (Asteriou and Hall, 2016).

III. The Hannan-Quinn Criterion (HQC)

According to Pesaran (1997), the HQC was proposed for selecting the order of autoregressive moving average or vector autoregressive (VAR) models. The HQC is an alternative selection criterion to the AIC and the SBC, and therefore, its strength lies between the AIC and the SBC. In regression models, the HQC can be presented in the following form:

$$HQC_{\sigma} = \log \sigma + \left(\frac{2 \log \log n}{n} \right) \quad (4.30)$$

Under certain circumstances, the HQC can prove to be as consistent as SBC, especially in large dataset. Claeskens and Hjort (2008) noted that the HQC is like the SBC, but it is unlike the AIC because it is not asymptotically efficient.

4.3.3 The Co-integration Analysis

Most economic theories are based on the equilibrium models which require the economy to go back into the long-run equilibrium relation. This section will focus on the thorough discussion of the co-integration, followed by the Johansen VECM model, which estimates both short and long-run interaction among variables in the model. The co-integration analysis was proposed by Granger (1981) with the aim of reconciling the non-stationary processes with the notion of long-run equilibrium. Engle and Granger (1987) formulated a strong theoretical framework for testing and estimating the co-integrated non-stationary variables.

Co-integration analysis provides a formal framework for testing a long-run relationship between variables from their actual series. The co-integration technique allows for non-stationary time series data to be estimated in such a way that they produce valid and reliable statistical results. Co-integration is also able to test for the validity of existing economic theory between the macroeconomic variables under investigation. If a suggested economic relationship between the variables under examination exists, then the co-integrated relationship should exist. In a nutshell, co-integration analysis means testing for a long-run equilibrium relationship suggested between the variables used in the system. A VAR/VECM model applicable to this particular study can be written as follows:

$$\Delta y_t = \mu_0 + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_{iy} \Delta y_{t-i} + \varepsilon_t \quad (4.31)$$

From the above equation (4.31), if Π is equal to zero, then there is no co-integration between variables in the model. If Π has full rank then all y_t must be stationary since the variables on the left and the right side are stationary. If Π has less than full rank but is not equal to zero then the co-integration exists among the variables. According to Enders (2010), the theory of co-integration suggests that there is linear combination of non-stationary series that is converted to become stationary. The analysis of co-integration allows non-stationary series to be used in such a way that estimated results do not amount to spurious regression. Co-integration provides researchers with a formal framework for assessing a long-run co-integrating relationship among variables in the model from the actual data series.

As mentioned earlier, if variables are non-stationary, running the regression models with non-stationary data will yield spurious results if modelled in level form. Hence, a remedy for this problem is to convert non-stationary time series into first differences to make them stationary. However, the major disadvantage with differencing the data series is that, while it is good for estimating the short-run effects and in differencing data series, a lot of information pertaining to long-run relationships among variables is lost in the process. Hence, the co-integration approach is more effective in dealing with non-stationary data because of its ability to give both short-run and long-run relationships.

As previously mentioned, if we estimate the regression model with non-stationary series, then the model will yield spurious results. In order to deal with the problem of spurious regressions, the series need to be tested for the presence of a unit root, i.e. tested to see if the data series is stationary or non-stationary and at which order of integration. If all variables are non-stationary $I(1)$ but the regression produces a stationary $I(0)$ error term, then the equation is assumed to be co-integrated among the variables. A random walk is a common problem with the non-stationary time series data, hence testing for the existence of a random walk allows us to employ the Dickey-Fuller (DF) test presented in the following specification:

$$y_t = y_{t-1} + u_t \quad (4.32)$$

This series is non-stationary because its mean is constant but the variance is not constant. If we add a constant in this equation, it becomes a random walk with a drift. In order to convert this series into stationary data series, a random walk needs to be converted into first differences in the following form:

$$\Delta y_t = u_t \quad (4.33)$$

The DF test is used to determine whether the variable is stationary, at which order of integration. To deal with the issue of autocorrelation, the DF test can be augmented by adding various lagged dependent variables, (i.e. ADF). This process leads to the estimation of the following Augmented Dickey-Fuller (ADF) test equation:

$$\Delta y_t = (\rho - 1)y_{t-1} + \alpha_i \sum_{i=1}^m \Delta y_{t-i} + u_t \quad (4.34)$$

where the value of (m) is the number of lags which can be determined by AIC or SBC criteria, which both aim at maximising the amount of information. Enders (2010) asserts that there are three different methods used for testing co-integration, namely, Engle-Granger (1987), Johansen (1988) and Stock-Watson (1988) methodology. However, the study will use the Johansen (1988) co-integration method for multiple vectors and Stock-Watson (1988) single co-integrating equations testing approach as confirmatory tests to determine the long-run interactions among variables in the proposed model. The steps that are followed in Johansen's methodology include checking for the properties of integration, setting the appropriate lag length and the ability of choosing the right deterministic components in the multivariate model, determining the rank for a number of co-integrating vectors, testing the exogeneity of variables, and lastly, testing for the linear restrictions in the co-integrating vector.

4.3.3.1 The Engle-Granger Tests for Co-integration

In order to examine co-integration between non-stationary variables, one has to run an OLS regression model and save the residuals. Then one has to run an ADF test on residual in order to determine if the variables are $I(0)$ or $I(1)$. In time series data, variables are assumed co-integrated if residuals are stationary. Notably, non-stationary variables $I(1)$ cancel each other out in order to produce stationary $I(0)$ residuals. Consider the following equation:

$$y_t = \beta_0 + \beta_1 x_t + u_t \quad (4.35)$$

where y_t and x_t are non-stationary variables. In order to test if these two variables are co-integrated, one needs to estimate a regression model. If the critical value is greater than the calculated value, then the null hypothesis stating that the series is non-stationary is rejected and concludes that the error term is stationary and, y_t and x_t are co-integrated. Engle and Granger (1987) suggested that if y_t and x_t are co-integrated, the relationship between these two variables can be expressed as an error correction model (ECM), whereby the error term from the model, lagged once, acts as an error correction term. Therefore, co-integration ascertains the long-run relationship among variables, while ECM provides the evidence of the short-run adjustments between the variables in the model. The ECM can therefore be presented in the following form:

$$\Delta y_t = \chi_0 + \chi_1 \Delta x_t - \tau(u_{t-1}) + \varepsilon_t \quad (4.36)$$

where τ is the coefficient of an error correction term and should have a negative sign, as suggested by economic theory. The value of an error correction term measures the speed of adjustment back to the equilibrium, following exogenous shocks in the estimated model. The coefficient of an error correction term (u_{t-1}), can also be presented as: $(y_{t-1} - x_{t-1})$, which represents the residuals from the co-integrating vectors.

4.3.3.2 The Johansen Co-integration Test

The co-integration and VECM was first introduced by Engle and Granger (1987) as a procedure to analyse the long-run relationships among variables in the proposed model. However, the major disadvantage of this procedure is that if there are two or more co-integrating vectors in the model, one of them may not be estimated using Engle-Granger test procedure. Hence, the Johansen (1988) approach is a more sophisticated technique to estimate a model with more than one co-integrating vector. The major advantage of Johansen and Juselius's (1990) approach is that it addresses the multi-co-integrating problem, unlike the single equation residual test, which is capable of identifying only one co-integrating relationship, irrespective of the number of variables in the system.

With a VAR approach, it is possible to produce long-run coefficients and error correction models, which are referred to as the Johansen Maximum Likelihood procedure. The major advantage of the Johansen Maximum Likelihood (ML) test is that it has the ability of determining the number of co-integrating vectors in the system. The main difference with the Engle-Granger approach is that it is possible to have two or more co-integrating vectors and this test is able produce a number of statistics, which can be used to ascertain the number of co-integrating vectors in the model. The second difference from the Engle-Granger test is that there are two separate tests for the number of co-integrating relationships and they do not always agree with the number of co-integrating vectors in the model.

The Johansen methodology suggests that all variables are endogenous in the model. Hargreaves (1994) compared the Johansen co-integration test with five other co-integration tests and recommended that the Johansen test is the best approach if the number of observations is genuinely substantial. However, the major criticism around the Johansen co-integration is that a large sample size can be sensitive to the number of lags and autocorrelation in this test. The Johansen co-integration starts through the context of a VAR(p) given by:

$$Y_t = \mu + A_1 Y_{t-1} + \dots + A_p Y_{t-p} + \varepsilon_t \quad (4.37)$$

where Y_t represents the $n \times 1$ vector of I(1) endogenous variables and ε_t is an $n \times 1$ vector of innovations. The above VAR can be converted into the following VECM:

$$Y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (4.38)$$

The Johansen approach is based on testing for coefficient matrix (Π), which estimates the values of α and β through a reduced-rank regression.

$$\Pi = \alpha\beta \quad (4.39)$$

where, α represents the speed of adjustment coefficient parameters in the ECM and β represents co-integrating vectors. If the Π has reduced rank ($r < n$), then there is a $n \times r$ matrix α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta'Y_t$ are stationary (Österholm and Hjalmarsson, 2007). Johansen (1988) proposed the co-integration test based on the trace and maximum eigenvalue tests to ascertain the long-run co-

integrating relationships among variables in the system. The trace and maximum eigenvalue test can be presented as follows:

$$\lambda trace(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad (4.40)$$

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

In the above equations (4.40 and 4.41) of the trace and maximum eigenvalue tests, the $\hat{\lambda}$ denotes the estimated value of i th eigenvalue of the coefficient matrix from the long run. T represents the number of observations and r is the number of co-integrating relationships. The $\lambda trace$ test determines the null hypothesis of r co-integrating vectors against the alternative hypothesis of n co-integrating vectors. The λmax tests probes the null hypothesis of r co-integrating vectors against the alternative hypothesis of $(r + 1)$ co-integrating vectors. Moreover, the trace statistic test is more superior because its degrees of freedom can be adjusted and it is more robust to skewness and excess kurtosis (Österholm and Hjalmarsson, 2007). Therefore, for the purpose of this study, the researcher will employ the Johansen methodology for co-integration analysis.

4.3.4 Error Correction Model (ECM)

Engle and Granger (1987) asserted that there is a valid error correction representation of data series if variables are co-integrated in the model. Therefore, an ECM will be employed in the case of multiple time series models most commonly used for data where underlying variables have a long-run stochastic trend, also known as co-integration. Estimating ECMs is useful in ascertaining both short and long-run relationship of data series. Enders (2010) suggested that co-integrated variables are highly influenced by their time paths and the manner in which any deviation from long-run equilibrium occurs.

As previously stated, if there is co-integration between y and x , the relationship between co-integrated variables can be expressed as an ECM in which the error term from the model acts as an error correction term (Engle and Granger, 1987). The ECM addresses how y and x behaves in the short-run consistent with a long-run equilibrium. While co-integration analysis ascertains the long-run relationship, ECM ascertains the

short-run relationship between variables. An ECM can be presented in the following form:

$$\Delta y_t = \chi_0 + \chi_1 \Delta x_t - \tau(u_{t-1}) + \varepsilon_t \quad (4.42)$$

where, ε_t is the white noise disturbance term. The variables x_t and y_t change in response to the shocks represented by ε_t . The τ , is the coefficient of an error correction term which should be negative as suggested by the economic theory. The τ measures the speed of adjustment back to equilibrium following an exogenous shock in the system. Furthermore, one of the speed adjustments must be non-zero; if they are both zero, this simply means that there is no long-run equilibrium relationship between the variables and that the model is neither of error correction nor co-integration.

Put simply, ECMs estimate the speed of adjustment by an endogenous variable after changes in other variables in the system. A good model should incorporate both short-run dynamics and long-run equilibrium simultaneously and therefore the ECM should close this gap when analysing co-integration. The adjustment coefficients will be considered in this particular study, which can be expressed in the following ECM:

$$\varepsilon = (lemp - \beta_{12}fdi - \beta_{13}gdp - \beta_{15}inf - \beta_{14}top - \beta_{14}lc)_{t-1} \quad (4.43)$$

From the above equation (4.43), let us assume that the employment level increases by more than its co-integrating relationship in the previous period, while FDI, GDP, inflation, trade openness and unit labour costs dictate. Then in the following period some or all five variables will have to adjust in order to restore equilibrium to this long-run relationship. Furthermore, the trait of an error correction is that a change in one variable responds to a change in the other variable and to the gap between the variables in the system in the previous period.

4.3.5 The Deterministic Component in the VAR Model

Selecting the deterministic component is the second step that must be undertaken before estimating the VAR model. It is a necessary requirement of making assumptions about the deterministic components in the co-integrating relationships. Selecting the deterministic component is all about ascertaining whether an intercept or trend should be included in the model. Asteriou and Hall (2016) assert that there are five different deterministic criteria that can be considered when one is testing for co-integrating relationships among variables in the model:

- I. there are no deterministic trends and intercepts in the co-integrating equations or VAR model;
- II. there are no deterministic trends but there are intercepts. In this case, the intercept is restricted to the long-run co-integrating relationship;
- III. the co-integrating equations only have intercepts in the co-integrating vector. This model assumes that the intercept in the co-integrating equation is cancelled out by the VAR intercept, thus, leaving one intercept in the short run;
- IV. there is a linear trend in the co-integration equation but not in the VAR and intercepts in both the co-integrating equation and the VAR model. This model does not have a time trend in the short-run;
- V. there is an intercept and quadratic trend in the co-integration equation, and an intercept and linear trend in the VAR model.

In modern economics, assumption (I) and (II) are not plausible for practical econometric investigations of macroeconomic time series data. Assumption (IV) and (V) are normally based on a prior knowledge about the nature of the relationship that exists among the variables under investigation. On the other hand, many economic relationships usually follow assumption (II) and (III). Therefore the researcher focuses on these two assumptions. The study will use one of the two remaining assumptions, i.e., (II) or (III) to ascertain the long-run equilibrium relationship among variables in the system. However, this particular study estimates both cases (II) and (III), but assumption (II) seems to produce more plausible results with regard to the long-run relationships among variables. Hence, the researcher proceeds to estimating the Johansen co-integration test based on assumption (II) with variables in level form.

4.3.6 Vector Error Correction Mechanism (VECM) Approach

The VECM approach is a commonly used model in the practice of modern econometric empirical analysis. The VECM representation allows one to differentiate between the short-run and long-run dynamic relationship between the variables in the system. The VECM is important to a VAR model because of its ability of imbedding an ECM term in the model. The long-run coefficients of the VECM must be interpreted as an opposite sign due the negative signs in the ECM equation. As previously mentioned, the short-run dynamics between FDI, employment levels, and other variables in the system will be assessed through the use of the following VAR(p) model:

$$InY_t = \mu + \sum_{i=1}^p \Gamma_i InY_{t-i} + \varepsilon_t \quad (4.44)$$

The above equation (4.44) represents a VAR(p), where $InY_t = EMP_t, FDI_t, GDP_t, INF_t, TOP_t, LC_t$ is a (6×1) column vector of six endogenous variables, i.e. employment, FDI, GDP, inflation, trade openness and unit labour costs. μ denotes a (6×1) vector of the constants, Γ_i is a (6×6) matrix of autoregressive coefficient regressors, p represents the order of VAR and the ε_t vector comprises composites of random shocks in the system. The above VAR(p) equation will be converted into a VECM equation in order to apply the Johansen VECM methodology. Therefore, an appropriate Johansen (1990) VECM methodology is estimated to determine the notion of a long-run co-integrating relationship that exists between FDI and employment levels, and other variables in the model. Brooks (2013) asserted that VECM is an appropriate model that captures the long-run and short-run dynamic relationships among employed variables in the model. In this particular study, the VECM captures the long-run co-integrating relationship between employment, FDI, GDP, inflation, trade openness and unit labour costs, as well as the short-run dynamics that are consistent with the long-run equilibrium. The VECM presentation of the study can be presented as follows:

$$\Delta InY_t = \mu + \Pi InY_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta InY_{t-i} + \varepsilon_t \quad (4.45)$$

Where, InY_t denotes $k \times 1$ vector of I(1) variables, μ is the coefficient of intercept, Π represents $k \times k$ long-run multiplier matrix and Γ_i represents $k \times k$ short-run coefficient matrices. The notation of p represents the order of VAR. ε_t represents innovations in the model. A VAR/VECM optimal lag length selection criterion will be applied in eviews9 statistical software. A number of different selection criteria applicable to this study have already been discussed in sub-section (4.3.2.5) such as AIC, HQN, SBC, Final Error Prediction Criterion (FPE) and the sequential modified log-likelihood ratio criterion (LR). These are all relevant and applicable tests in this particular study.

The following step in the process will be to estimate the number of co-integrating vectors among variables in the system. As previously stated, to test whether variables are co-integrated or not, the researcher uses the co-integration tests called the

Johansen trace and maximum eigenvalue tests. The Johansen co-integration test will be computed to ascertain a long-run co-integrating relationship and it is also based on the estimation of the ECM by the maximum likelihood, under various assumptions about the trend or intercepting parameters, and the number of co-integrating vectors (k), and then conducting likelihood ratio tests. Therefore, the presence of co-integration among variables will be tested using the trace and maximum eigenvalue tests under the Johansen co-integration test as previously discussed in subsection 4.3.3.2 of the study.

The VECM (Πy_{t-1} term) from the above equation can be expanded in the following manner:

$$\Pi y_{t-1} = \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \\ \alpha_{31} \\ \alpha_{41} \\ \alpha_{51} \\ \alpha_{61} \end{bmatrix} (\beta_{11} \quad \beta_{12} \quad \beta_{13} \quad \beta_{14} \quad \beta_{15} \quad \beta_{16}) \begin{bmatrix} lemp \\ lfdi \\ lgdp \\ inf \\ ltop \\ lc \end{bmatrix}_{t-1} \quad (4.46)$$

In the above equation (4.46), β_{11} represents a normalised equation. β_{12} is the elasticity of employment levels with respect to FDI, interpreted as a long-run effect of FDI on employment levels. β_{13} is the elasticity of employment levels with respect to GDP. β_{14} is the elasticity of employment levels with respect to inflation. β_{15} is the elasticity of employment levels with respect to trade openness. Lastly, β_{16} is the elasticity of employment levels with respect to labour costs and interpreted as the long-run effect of labour cost on employment levels.

The coefficient of FDI in the *a priori* expectations of the model is expected to be positive and statistically significant in relation to employment levels, since the economic literature suggests that FDI inflows ought to boost employment levels in the economy in the long-run. GDP is also expected to have a significant positive impact on employment as these two variables, (i.e. GDP and employment) always complement each other, i.e., a rise in GDP eventually leads to an increase in employment levels in any economy. The coefficient of trade openness rate is actually not certain as it depends on its variability within the time period. The coefficient of labour costs is expected to be negative and significant in relation to employment levels. The Phillips curve states that there is an inverse relationship between

unemployment and inflation rate. Hence, the researcher expects a positive and significant link between inflation and employment levels in the South African economy, as suggested the economic theory, also discussed in Chapter Two of the study.

4.3.6.1 The Model Specification for South Africa

The co-integration between employment, FDI, GDP, inflation, trade openness and unit labour costs in South Africa will be estimated through the use of the VECM framework via the eviews9 statistical software in the chapter 5. The co-integrating VAR model will be expressed in the following form of a VECM framework as adapted from Johansen methodology.

$$\Delta \ln Y_t = \mu + \Pi \ln Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta \ln Y_{t-i} + \varepsilon_t \quad (4.47)$$

As previously mentioned, $\ln Y_t$ denotes $k \times 1$ vector of I(1) independent variables. In the context of this work, these selected endogenous macroeconomic variables include employment, FDI, GDP, inflation, trade openness and unit labour costs.

4.3.6.2 The Granger Causality

According to Granger (1969), causality can be sub-divided into a short and long-run causality. This requires the use of ECM or VECM, depending on the approach for determining the causal relationship. The long-run causality is determined by the error correction term, whereby if it is significant, then it indicates the existence of a long-run causality from exogenous to endogenous variable (Granger, 1969). On the other hand, the short-run causal link is tested using the joint significance of the lagged explanatory variables through the F-test or Wald test. Hence, the Granger causality will be computed in order to check the causality from FDI in relation to employment levels and other variables specified in the model. Granger causality is based on the prediction that if a signal X_t "Granger-causes" a signal Y_t , then past values of X_t should contain information that helps predict Y_t above and beyond the information contained in the past values of Y_t only. Furthermore, the concept of Granger causality involves the impact of past values of X on the current value of Y . Granger causality answers the question of whether past and current values of X help predict the future value of Y . Granger causality is different from exogeneity tests, which explain whether the current value of X explains the current and future value of Y .

Before forming an ECM, there must be a co-integration between the variables, given that co-integration implies a significant error correction term. Thus, the co-integration test can be viewed as an indirect test of long-run causality between variables. It is also possible to have evidence of a long-run causality, but with no short-run causal relationship and vice versa. Testing for a long-run causal link between two variables in a multivariate causality can be more problematic, as it is impossible to tell which explanatory variable is causing the causality through the use of error correction terms. The ECM analogous to the dynamic equation from the Engle-Granger procedure can be presented as follows:

$$\Delta Y_t = \beta_0 \Delta X_t - (1 - \alpha_1) ECM_{t-1} \quad (4.48)$$

In the above equation (4.48), Δ is a first difference operator and β_0 is a constant. ΔY_t represents the endogenous variable, and ΔX_t represents the exogenous variable, and the component ECM_{t-1} is a row vector of lagged long-run variables. In this regard, the dynamic equation will not contain a constant unless the long-run equation contains a linear trend. The sum of coefficients on the lags of endogenous variables should lie between zero and one for the equation to be stable; hence, the co-integration between the variables will ensure that this is the case.

4.3.7 The Single Equation Methods

This section gives a discussion of single equation models which include OLS, FMOLS, DOLS and CCR, since these models will also be employed as supporting and confirmatory models of a VAR/VECM approach. Co-integrating regression equations that are discussed in this section include the FMOLS, DOLS and CCR model. Importantly, variable Y_t and X_t are said to be co-integrated if $Z_t = Y_t - \theta X_t$ is stationary. Where, θ is the coefficient of co-integration. The difference $Z_t = Y_t - \theta X_t$ is also known as the equilibrium error, since it measures the deviation of Y_t and X_t from the long-run co-integrating relationship. The major problem associated with estimating co-integrating regression models is that its power lies upon the actual length of time that the sample period spans. This section will also present various formal diagnostic tests and stability analysis of these single-equation models.

4.3.7.1 Ordinary Least Squares (OLS) Model Estimation

The Ordinary Least Squares (OLS) regression is a linear estimation technique that can be employed to test for a single response variable recorded on an interval scale. This estimation technique can be used to assess the bivariate or multivariate relationship among variables, where one can hypothesise that one variable depends on the change of another or on the combination of multiple variables. OLS procedures are carried out if all variables are stationary. In contrast to this, if variables are non-stationary, then OLS would render a spurious regression. As previously explained, if all variables are found to be $I(0)$, the study will also estimate OLS, FMOLS, DOLS and CCR. These co-integration regression methods (FMOLS, DOLS and CCR) are employed to estimate the single co-integrating vector that characterises the long-run relationship between the FDI and employment levels. The OLS regression model with multiple explanatory variables as of this study can be written in the following form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon_t \quad (4.49)$$

From the above equation (4.49), β_0 represents an intercept that indicates the value of Y when all values of the explanatory variables are zero. β represents the coefficients of five explanatory variables in the OLS model of the study. The above OLS model (4.46) can be converted into a six-variable model specification of the study as follows:

$$EMP = \beta_0 + \beta_1 FDI + \beta_2 GDP + \beta_3 INF + \beta_4 TOP + \beta_5 LC + \varepsilon_t \quad (4.50)$$

Where EMP is the dependent variable denoting employment. FDI, GDP, inflation (INF), trade openness (TOP) and labour cost (LC) are explanatory variables. As previously stated, equation (4.50) will be transformed into natural logarithmic form in order to convert nominal variables into real variables and be able to interpret them as elasticities. The natural logarithmic presentation of variables can be written in the following form:

$$\Delta \ln EMP_t = \beta_0 + \beta_1 \ln FDI_1 + \beta_2 \ln GDP_2 + \beta_3 \ln INF_3 + \beta_4 \ln TOP_4 + \beta_5 \ln LC_5 + \varepsilon_t \quad (4.51)$$

where:

$\Delta \ln EMP_t$ is the natural logarithm of employment at time t ;

$\ln FDI_1$ is the natural logarithm of FDI;

$\ln GDP_2$ is the natural logarithm of GDP;

INF_3 represent inflation already in percentage form;

TOP_4 represent trade openness already in percentage form ;

$\ln LC_5$ is the natural logarithm of unit labour costs.

β_0 is the constant coefficient

ε_t is the error term

The OLS regression model can then be estimated using equation (4.51). The logarithmic transformation was carried out only on variables with data on monetary values and indexes, i.e. employment, FDI, GDP and unit labour costs. The data of inflation and trade openness was already in percentage form, hence they were not transformed into natural logarithms because they can be interpreted as elasticities. The significance and the goodness-of-fit of the OLS regression model can be assessed through the use of the F-statistic and R^2 of the regression model, respectively using the above equation (4.50). For OLS to be the best model explaining the relationship between the dependent (Y) and explanatory variables (X values), the Gauss-Markov conditions must be satisfied. Therefore, this will mean that the regression model must be free from serial correlation (no correlation between explanatory variables and error terms), and residuals must be normally distributed and homoscedastic. Hence the OLS regression model is the good model.

While it is simple to estimate the OLS regression model, it may also have some major setbacks. OLS estimates may be biased in data with small sample sizes and this bias may lead to untrusted F statistic and R^2 . Secondly, if the number of regressors is more than two, the number of co-integrating vectors may also be more than one, but with OLS estimation, it is impossible to give economic intuitive logic in this regard. The difficulties associated with the estimation of the OLS model have led to the proposal of other alternative estimation procedures, such as Johansen co-integration methodology, which has the ability of accommodating more than two co-integrating vectors in the regression model with more than two regressors, as of this study. As previously mentioned, the study employs the Johansen VECM approach as the main model to examine the short and long-run interaction among variables in the system.

4.3.7.2 Fully Modified Ordinary Least Squares (FMOLS) Model

The FMOLS was proposed by Phillips and Hansen (1990) as a co-integration model for only one co-integrating vector. The model involves adjusting OLS long-run estimates in such a way that we overcome any form of biasness owing to serial correlation and endogeneity problems in OLS residuals (Phillips and Hansen, 1990 and Harris and Sollis, 2003). Thus, the estimated results will become asymptotically unbiased and efficient allowing one to use the standard Wald tests through the asymptotic chi-square (X^2) statistical inference (Belke and Czudaj, 2010). Consider the following (Y_t, X_t') vector process:

$$Y_t = X_t' \beta + D_t' \gamma_1 + \varepsilon_{1t} \quad (4.52)$$

From the above equation (4.52), Y_t represents the dependent I(1) variable. X_t is a stochastic regressor as governed by $X_t = \Gamma_{21}' D_{1t} + \Gamma_{22}' D_{2t} + \varepsilon_{2t}$. Furthermore, $D = D_{1t}', D_{2t}'$ represents the deterministic trend of regressors and ε_{1t} is the error term with a zero mean and covariance (Ω). Therefore, the FMOLS can be presented as follows:

$$\hat{\theta}_{FMOLS} = \begin{bmatrix} \hat{\beta} \\ \hat{\gamma}_1 \end{bmatrix} = \left[\sum_{t=1}^T Z_t Z_t' \right]^{-1} \left[\sum_{t=1}^T Z_t Y_t^+ - T \begin{bmatrix} \hat{\lambda}_{12} \\ 0 \end{bmatrix} \right] \quad (4.53)$$

From equation (4.52) $Z_t = (X_t' D_t)'$ and $Y_t^+ = Y_t - \hat{\omega}_{12} \hat{\Omega}_{22}^{-1} \hat{\varepsilon}_2$ indicates the transformed data. $\hat{\lambda}_{12}^+ = \hat{\omega}_{12} \hat{\Omega}_{22}^{-1} \hat{\Lambda}_{22}$ represents the estimated bias correction term with the long-run covariance matrices $\hat{\Omega}$ and $\hat{\Lambda}$ and their respective elements that are computed through the use of $\varepsilon_t = (\hat{\varepsilon}_{1t}', \hat{\varepsilon}_{2t}')'$. Inder (1993) claimed that the biasedness of the FMOLS estimator is as large as the biasedness of the OLS estimator. Stock and Watson (1993) assert that for data generating processes, FMOLS estimator tends to have biases as compared to the OLS estimator (Montalvo, 1995).

4.3.7.3 Dynamic Ordinary Least Squares (DOLS) Model

The DOLS model was introduced by Stock and Watson (1994) as a single equation model for the simple estimation of co-integrating coefficient estimates. DOLS is a parametric model which clearly estimates the lagged first difference regressors (Saayman, 2010). This model suggests that the added value of lags (q) and leads (q) of ΔX_t reduces the long-run correlation between error terms (ε_{1t} and ε_{2t}) (Belke and Czudaj, 2010). The leads and lags of ΔX_t eliminate asymptotically any possible

biasedness due to endogeneity or serial correlation. Estimating long-run co-integrating parameters using the DOLS involves regressing any $I(1)$ variable on another $I(1)$ variable, and any $I(0)$ variable, and leads and lags of the first differences of any $I(1)$ variable. Therefore, the DOLS regression model is more robust for co-integration analysis. It produces unbiased long-run coefficients (Harris and Sollis, 2003). The DOLS presentation can be written as follows:

$$Y_t = X_t'\beta + D_t'\gamma_1 + \sum_{j=-q}^r \Delta X_{t+j}'\delta + \varepsilon_{1t} \quad (4.54)$$

From the above equation (4.54), the DOLS estimator is given by $\hat{\theta}_{DOLS} = (\hat{\beta}', \hat{\gamma}_1)'$. The number of leads and lags will be selected using the Akaike Information Criterion (AIC). The DOLS is one of the co-integrating regression models; hence if there is evidence of co-integration between variables, then the long-run co-integrating relationship will be estimated using the DOLS after confirming with the hypothesis testing of co-integration. Moreover, in this case, the OLS produces more accurate and robust estimates of a long-run relationship (Enders, 2010).

However, the major disadvantage of this model is that it assumes that there is only one co-integrating relationship, and therefore it is unable to estimate multiple co-integrating relationships if there is more than one co-integrating vector. This model may assume that there is only one co-integrating vector, even if there are two or more co-integrating vectors, which may lead to inefficiency and unreliable estimated results. According to the work of Monte Carlo, Stock and Watson (1993), DOLS is more robust in data series with small observations as compared to other alternative long-run estimators, including those models proposed by Engle and Granger (1987), Johansen (1988) and Phillips and Hansen (1990).

4.3.7.4 Canonical Co-integrating Regressions (CCR) Model

The CCR model was introduced by Park (1992) as a non-parametric model for a single co-integrated vector. The CCR estimator transforms variables into a co-integrating regression that removes the second-order bias of the OLS estimator. The transformation of the variables has the ability of eliminating endogeneity caused by the long-run correlation of Y_{1t} and Y_{2t} . It also eliminates the asymptotic bias caused by possible cross correlation between ε_{1t} and ε_{2t} (Montalvo, 1995). This model involves adjusting the integrated properties using stationary components to account for long-

run correlation between regressors and the error term. From equation (4.52), the CCR presentation can be written as follows:

$$\hat{\theta}_{CCR} = \begin{bmatrix} \hat{\beta} \\ \hat{\gamma}_1 \end{bmatrix} = \left[\sum_{t=1}^T Z_t^* Z_t^{*'} \right]^{-1} \sum_{t=1}^T Z_t^* Y_t^* \quad (4.55)$$

From equation (4.55), $Z_t^* = (X_t', D_t')'$, $X_t^t = X_t - (\hat{\Sigma}^{-1} \hat{\Lambda}_2)' \hat{\varepsilon}_t$ and $Y_t^* = Y_t - \left[\hat{\Sigma}^{-1} \hat{\Lambda}_2 \tilde{\beta} + \begin{bmatrix} 0 \\ \hat{\Omega}_{22}^{-1} \hat{\omega}_{21} \end{bmatrix}' \varepsilon_t \right]$ represents the transformed data. The coefficients of $\tilde{\beta}$ represent the estimates of the co-integrating equation that uses static OLS. $\hat{\Lambda}_2$ is the second column of $\hat{\Lambda}$ and $\hat{\Sigma}$ is the estimated contemporaneous covariance matrix of error terms. The CCR is similar to the FMOLS estimator, except that FMOLS only transforms the endogenous variable and corrects the OLS estimates in the regression of the modified Y_{1t} (Montalvo, 1995).

4.4 Model Diagnostic Inspection

The model diagnostic instruments will be used in this particular study in order to check for serial correlation, normality, multicollinearity, misspecification and heteroscedasticity in the regression model. The tests for model stability and structural breaks are also discussed in order to ascertain the stability and robustness of the models under investigation in this particular study.

4.4.1 Examination of the Residuals in the Regression Model

There are several diagnostic tests that can be used in order to measure the statistical adequacy of the regression models. From an econometric viewpoint, it is of paramount importance to examine and report the tests of autocorrelation, normality, misspecification and heteroscedasticity in econometric models in order to ascertain that the regression of classical assumptions of the OLS is not violated. The above mentioned tests are the most important and reliable diagnostic instruments in econometrics that ensure the reliability and validity of statistical results from the regression models, as they ascertain statistical adequacy of the estimated model.

I. Serial correlation

The presence of serial correlation or autocorrelation in the regression model implies that one of the classical assumptions of linear regression, which states

that residuals are not serially correlated, is violated. If they are auto-correlated, it means that coefficients are no longer efficient, hence rendering regression statistics that are invalid for testing purposes. The Breusch-Godfrey test (1978) is the most entrusted measure that is commonly used for detecting autocorrelation in the residuals.

II. Normality tests

The normality test is generally computed to determine if a dataset is well-modelled by a normal distribution. If the errors in the model are not normally distributed, this means that the OLS assumption, which states that residuals must be normally distributed with a zero mean and constant variance is violated. The measure of skewness must be equal to zero (0) and the measure of kurtosis must be equal to three (3) for errors to be normally distributed in the regression model. The Jarque-Bera test (JB) is a goodness-of-fit test applicable to the study, used to examine whether dataset has the skewness and kurtosis matching a normal distribution of errors in the model.

III. Functional Form Misspecification

OLS method is the best linear unbiased estimator under the full set of Gauss-Markov assumptions (Wooldridge, 2009). As previously mentioned, multiple regression models suffer from functional form misspecification, when it does not properly account for the relationship between the dependent variable and explanatory variables, for example, if employment is determined by $\log(EMP) \beta_o + \beta_1 FDI + \beta_2 FDI^2 + \beta_3 GDP + \beta_4 INF + \beta_5 TOP + \beta_6 LC + \varepsilon$. If we omit the squared term of FDI ($\beta_2 FDI^2$), we are committing a functional form of misspecification. Hence, this process will lead to biased estimators of β_o and coefficient parameters. As a result, we will not get unbiased estimators of any other parameters. Therefore, we do not estimate β_2 because FDI^2 is excluded from the model. Ramsey (1969) introduced the Regression Specification Error Test (RESET) in order to test for errors in the regression model that may lead to the inclusion of insignificant explanatory variables. Basically, the Ramsey RESET examines whether non-linear combinations of explanatory variables help to explain the dependent variable in the model.

According to Ramsey (1969), if a non-linear combination of the explanatory variables has the power of explaining the endogenous variable, then the model is misspecified. Misspecifying how FDI affects $\log(EMP)$ will result in biased estimations of the return to other regressors. The size of this biasness depends on the size of β_2 and the correlation among FDI^2 and explanatory variables. Even if one can obtain unbiased estimator of β_1 by chance, it would be impossible to estimate the return to FDI because it equals $\beta_1 + 2\beta_2 FDI$. Using a biased estimator of β_1 can be misleading, especially at extreme values of FDI. As mentioned earlier, any possibility of misspecification that occurs, if the endogenous variable is correlated with errors in the regression model, will be detected through the use of Ramsey RESET test.

IV. Heteroscedasticity

The presence of heteroscedasticity in the regression model is a violation of the classical regression model assumption, which says that observations of error terms are drawn from a distribution that has a constant variance σ^2 . The existence of heteroscedasticity in the model causes the regression model to underestimate the variances and standard errors, and thus leads to misleading statistical values (Asteriou and Hall, 2016). Therefore, the study will make use of the Breusch-Pagan (1979) test to detect the presence of heteroscedasticity in regression models.

4.5 Model Stability Analysis

In a modern econometric empirical analysis, it has become a common practice to test and check for the stability of the model over the estimated time period. The structural change and parameter instability will be inspected in order to deal with the structural breaks in the underlying data generating process. From the South African economic perspective, there are various reasons to suspect structural changes in employment levels; this is because of so many uncertainties in the economic stability of the country. For example, the global financial crisis in 2008 affected almost every macroeconomic variable in the world economy, so there could be a high possibility of a structural break during this period. Different types of diagnostic inspection instruments exist that examine structural breaks and model stability in econometric time series models.

Some of these diagnostic inspection instruments include the chow test, recursive analysis etc.

4.5.1 The Chow (1960) Test

According to Enders (2010), if a possible structural break is suspected during a particular period, the Chow (1960) test is the best diagnostic instrument that checks for structural change over time. For example, the global financial crisis in the year 2008 definitely led to the structural change of almost every macroeconomic variable in the economy of South Africa and the world economy as a whole. However, this particular study will not apply this approach for model stability analysis, due to its weaknesses compared to other structural breaks tests, such as the Hansen (1990) and Bai-Perron (2003) test for parameter stability, which examines the possibility of structural breaks in the model over the estimated period as well as parameter stability in the model. Moreover, in the event of any observed structural breaks in the model, the acceptable remedy is to split the dataset, or change the data frequency or apply the dummy variables to account for structural break effects in the estimated model.

4.5.2 Recursive analysis

The recursive statistics are usually plotted and computed in order to get a graphical demonstration of model stability over time. Gujarati and Porter (2009) asserted that the model is stable if the changes in the values of estimated parameters are small and random. Literally, if there are any observable and significant changes in estimated values of parameters, then the model is not stable and it has a structural break, but if there are no significant changes observed in estimated values of parameters then the model is considered as structurally stable, and hence there are no structural breaks in the estimation of the regression model.

4.6 Conclusion

The main aim of this chapter was discuss statistical techniques that will be applied in Chapter 5 in order to produce valid and reliable statistical results. This part of the study has been able to extensively outline stationarity as an important concept in a time series analysis, in order to understand and gain insight as to how economic time series behave over time. The chapter was able to address the importance of stationarity in

the time series data. The study was able to discuss the concept of co-integration analysis when analysing the long-run co-integrating relationship between variables. Moreover, the researcher was able to discuss methodological frameworks that will be estimated in this particular study, i.e. VAR/VECM and single-equation models (OLS, FMOLS, DOLS and CCR). This chapter was also able to accomplish its objective of outlining a clear and thorough discussion of procedures under which the data will be manipulated in an attempt to ascertain the short-run adjustment dynamics and long-run relationship between FDI and employment levels in the South African economy. The next chapter will focus on the detailed analysis, interpretation and discussion of the empirical results that were estimated through the use of four different econometric estimation techniques which include the VAR/VECM, OLS, FMOLS, DOLS and CCR model, in order to arrive at the best, most accurate and most reliable results.

Chapter Five: Empirical Analysis and Results

Interpretation

5.1 Introduction

The main purpose of this chapter is to execute the empirical estimation procedure that was undertaken in the previous chapter, as well as to present interpretations and discussion of the empirical results for the entire study. As mentioned earlier, the main focus of this particular research is to investigate the contribution of FDI to domestic employment levels in the South African economy. The study will estimate how selected macroeconomic variables have reacted to employment levels over the years in South Africa's economy, through the use of the VAR/VECM model, covering the periods of three decades, i.e. 1980-2015. As mentioned earlier, the study also uses the single and co-integrating equation methods, which consist of OLS, FMOLS, DOLS and CCR methods to support and confirm the results produced by the VAR/VECM model. The macroeconomic variables under consideration in the estimation process include employment, FDI, GDP, inflation, trade openness and unit labour costs.

The study exploited the IRF and Cholesky variance decomposition in order to check for the responsiveness of key selected macroeconomic variables to the shock of employment levels, which are both offered within the VAR model framework in investigating the short-term relationship that exists among these variables to achieve the research objectives. Moreover, the final stage in the investigation process will be to estimate the Johansen (1991) VECM approach in order to determine the long-run co-integrating relationships that exist between selected macroeconomic variables in the system. As previously mentioned, the study will make use of both multiple and single estimation methods to assess the interactions between the selected macroeconomic variables, in both the short and long-run. Moreover, the estimation of single equation models, which include simple OLS, FMOLS, DOLS and CCR approach will assist the researcher to support and verify the empirical results already produced by the VAR/VECM model framework.

The estimation procedure in Chapter Five is divided into eight different sections. Section 5.1 introduces this chapter. Section 5.2 focuses on the preliminary

examinations of the data series used in the study in order to reveal the basic features of data series. This section will also demonstrate the basic descriptive statistics, graphical analysis of data and correlation matrix of the variables. Section 5.3 deals with the estimation procedures of stationarity test and determination of integration properties of the variables through the use of the ADF and PP tests. The primary aim of these tests is to separate the $I(1)$ variables (non-stationary) from $I(0)$ variables (stationary). Hence, the results of stationarity are fully discussed in section 5.3.

Section 5.4 presents the discussion of estimated results of the VAR and VECM analysis obtained in the estimation processes. This estimation process gives the rise to the estimation of the short-run and long-run interactions that exist among variables in the system. Therefore, this section firstly starts by estimating the short-run relationship between the variables, using the unrestricted VAR model with the lag selection done through the use of the AIC and Final Prediction Error (FPE). Secondly, to determine the long-run relationship between variables, the study uses the Johansen co-integration methodology. The issue of co-integration between the variables gives rise to an estimation of the long-run equilibrium elasticities, based on co-integrating vectors. Therefore, the final stage will be to estimate the Johansen VECM method in order to reveal the short-run and long-run elasticity coefficients of the three-variable model, including the IRF and variance decomposition. The study also estimates the Granger causality test in order to ascertain a causal link between employment, FDI and GDP under the VAR/VECM model framework.

5.5 gives a discussion and interpretation of the results estimated by single-equation estimation methods through the use of OLS and co-integrating equation models (FMOLS, DOLS and CCR) in order to verify and support the short-run and long-run results obtained from the VAR/VECM model framework. Section 5.6 deals with the discussion of entire findings of the study and draws conclusions in line with the objectives and hypotheses of the study. Furthermore, the empirical results from the estimation procedure of both multiple and single-equation models are clearly presented, reported, interpreted and discussed in the manner and sequence in which they were discussed in Chapter Four. Finally, Section 5.7 is the last section, concluding the whole chapter.

5.2 Data Description

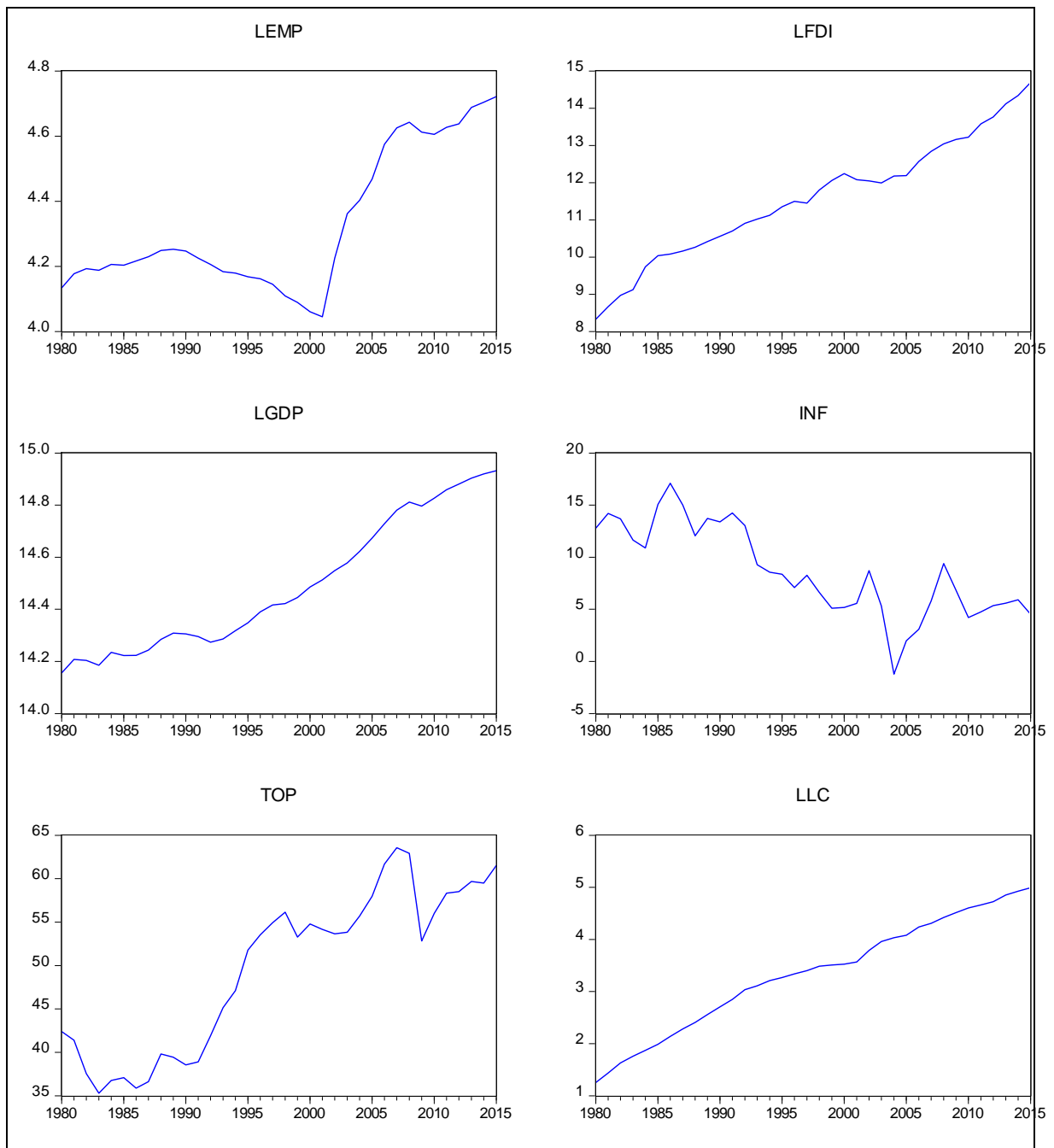
It is imperative to conduct preliminary examination of the data series before progressing to the specification and estimation of models in order to reveal the basic features of the data series especially when one is using time series data.

5.2.1 The Graphical Analysis of Data

The main purpose of graphical plots is to reveal visual demonstrations of time series data used in the study. Hence, the graphical demonstrations of the time series of variables are graphically displayed in Figure 5.1. The graphical displays in the level series reveal the evidence that the time series data are non-stationary in level form. The graph of the variables in level form confirms the correlation that exists between the variables as demonstrated in the correlation matrix in Table 5.2. Figure 5.1 presents a clear demonstration of how LEMP, LFDI, LGDP, TOP and LLC exhibit similar stochastic trends throughout the estimated time period, which indicates positive correlations among these variables. Conversely, inflation (INF) shows negative correlation with the other variables, hence confirming a relatively strong negative correlations as indicated in the correlation matrix (Table 5.2.). Furthermore, it can be concluded that while the variable LEMP, LFDI, LGDP, TOP and LLC are characterised by an upward trend, inflation displays a down-trend fluctuation with a significant dropping shock in 2002 due to the adoption of inflation targeting policy.

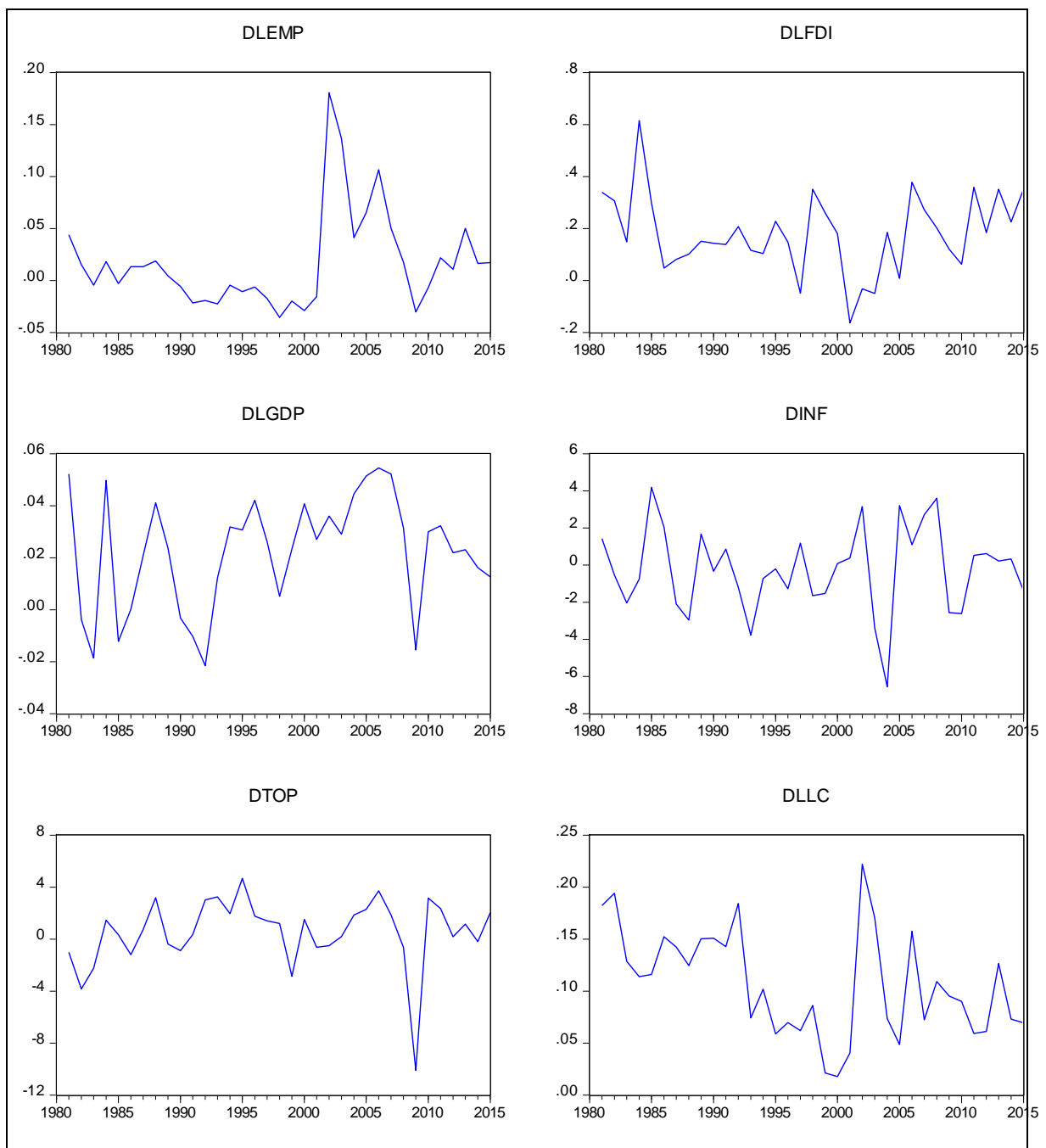
In contrast to the level series, Figure 5.2 demonstrates the graphs of a first differenced time series data and therefore, they show the evidence of stationary time series. The time series data of all the variables in first difference tends to fluctuate around zero mean, hence displaying stationary series. The overall implication of differencing the series is that all variables are integrated of order one $I(1)$ since they are converted into first differences. However, the formal stationarity tests are conducted in section 5.3 of this chapter (see table 5.3) in order to verify the researcher's initial intuitive logic.

Figure 5.1: Graphical Plots of Variables in Levels



Source: Generated by the researcher (SARB& StatsSA Data).

Figure 5.2: Graphical Plots of Variables in First Differences



Source: Generated by the researcher (SARB & StatsSA Data).

Finally, the visual demonstration of all variables of the time series data plots in Figure 5.1 exhibit a clear understanding of the correlation coefficients matrix that is demonstrated in table 5.2. Moreover, the graphical presentations of data series allow the researcher to easily and better understand the correlations that are difficult to comprehend. The correlation that exists between the variables is measured with the variables in their level form, i.e. Figure 5.1.

5.2.2 Descriptive Statistics

From the traditional practice of econometrics, the Kurtosis value of a normal distribution is expected to be equal to 3. The value of skewness for a normally distributed data series is expected to equal to zero. A positive value of skewness indicates a long right tail in the data distribution, while a negative skewness value indicates a long left tail in the distribution of data. The Jarque-Bera (JB) statistic is distributed as with two degrees of freedom with the null hypothesis stating that there is a normal distribution of data. From the table below (Table 5.1), the values means and medians of all the variables are almost identical and the skewness values for all variables are equal to zero, even though kurtosis values fluctuate around 1 to 3. This is an indication of how the data series for all variables is normally distributed.

Table 5.1: Descriptive Statistics for Variables in Logarithmic Form

| | LEMP | LFDI | LGDP | INF | TOP | LLC |
|--------------|----------|-----------|----------|-----------|-----------|-----------|
| Mean | 4.326783 | 11.56297 | 14.48971 | 8.639696 | 49.66905 | 3.345730 |
| Median | 4.225373 | 11.64873 | 14.41916 | 8.310781 | 53.40755 | 3.444286 |
| Maximum | 4.721174 | 14.69287 | 14.93235 | 17.10573 | 63.56155 | 4.994506 |
| Minimum | 4.044804 | 8.326517 | 14.15548 | -1.230073 | 35.30009 | 1.252763 |
| Std. Dev. | 0.216078 | 1.624835 | 0.256188 | 4.369068 | 9.304555 | 1.083740 |
| Skewness | 0.655104 | -0.054060 | 0.444750 | 0.055273 | -0.225356 | -0.258141 |
| Kurtosis | 1.853698 | 2.334917 | 1.713161 | 2.206435 | 1.549872 | 1.998233 |
| Jarque-Bera | 4.545983 | 0.681038 | 3.670748 | 0.962949 | 3.459017 | 1.905125 |
| Probability | 0.103004 | 0.711401 | 0.159554 | 0.617872 | 0.177372 | 0.385751 |
| Sum | 155.7642 | 416.2669 | 521.6294 | 311.0291 | 1788.086 | 120.4463 |
| Sum Sq. Dev. | 1.634143 | 92.40308 | 2.297127 | 668.1063 | 3030.116 | 41.10722 |
| Observations | 36 | 36 | 36 | 36 | 36 | 36 |

Source: Researcher's estimation results.

The above descriptive statistics table (Table 5.1) indicates a normal distribution of data for all variables. The data for all variables provide the evidence that the skewness values are equal to zero and there is a platykurtic distribution of data series, as given by their respective, positive kurtosis values, even though they are not equal to 3. However they are all positive and greater than one. The estimated minimum and maximum values are not significantly different from each other, indicating that there are very small variations that exist among variables. Thus, implying the stability of the data series throughout the estimated time period. Finally, table 5.1 provides the evidence that there is no outlier in the data series which may cause it to be symmetrical. The Jarque Bera tests show that at the 5% significance level, all the

series are deemed to be normally distributed, since all the P-values are greater than 0.05.

5.2.3 Correlation Matrix

Table 5.2: Correlation Matrix for All Variables

| | <i>LEMP</i> | <i>LFDI</i> | <i>LGDP</i> | <i>INF</i> | <i>TOP</i> | <i>LLC</i> |
|------|-------------|-------------|-------------|------------|-------------|------------|
| LEMP | 1.00 | | | | | |
| LFDI | 0.75 | 1.00 | | | | |
| LGDP | 0.88 | 0.95 | 1.00 | | | |
| INF | -0.47 | -0.76 | -0.75 | 1.00 | | |
| TOP | 0.62 | 0.87 | 0.88 | -0.86 | 1.00 | |
| LLC | 0.75 | 0.99 | 0.95 | -0.80 | 0.90 | 1.00 |

Source: Researcher's estimation results.

Table 5.2 presents correlation matrix results for all variables used in the model. The results of pair-wise correlations displayed in the correlation matrix indicate that there is a significant positive correlation that exists between employment, FDI, GDP, trade openness and labour costs. Conversely, there is a negative correlation observed between employment and inflation. Moreover, inflation is negatively correlated with all other variables in the model. The correlation value for FDI and labour cost; FDI and GDP; GDP and labour cost, and trade openness and labour cost are highly positively correlated, which may be a signal of a potential multicollinearity between these variables. However, it is very important to note that none of the variables are strongly correlated with employment as the main endogenous variable in the model.

Asteriou and Hall (2016) implied that, if a correlation value between the variables is above 0.9, then there is a huge possibility of the existence of multicollinearity between those variables. Finally, the depiction of correct correlation coefficients matrix signs between the variables confirms the general economic relationships that exist between the selected macroeconomic variables, as supported by economic theory, except the correlation value of the inflation rate, which contradicts the economic theory as advocated by the Phillips (1958) curve. Most of the correlation signs are in line with the economic theory discussed in chapter two and are consistent with the different trends that are exhibited by the variables under consideration in Figure 5.1.

5.3 Testing for Stationarity and Order of Integration

This section deals with testing for stationarity and integration properties for all the variables as well as the reporting and discussion of their results. As previously mentioned, it is a very important test for stationarity, as well as the integration properties of data series, before progressing to the specification and estimation of models in order to arrive at the right conclusion and avoid spurious regression results. The study utilises two unit root tests to determine if variables are stationary or not, and analyse the integration properties of data through the ADF and PP Tests. Judging from the graphical analysis of the data series in level form, Figure 5.1 reveals that the data series of almost every variable is non-stationary (i.e., have unit roots). However, after converting these variables into first difference, they can be rendered as stationary, i.e., $I(1)$ (see Figure 5.2).

According to Dickey and Fuller (1979), there are two alternative regression equations that should be used when testing for stationarity in the data series. The first model should include the constant in the equation; this model is considered to be extremely important because it exhibits a definite trend in the series which is a common practice in most macroeconomic time series. The second model ought to include the constant and non-stochastic trend in the equation. These two models were both conducted in this study, and they yielded similar results for the unit root testing. The results of both models are clearly presented and reported in table 5.3.

Table 5.3 presents the results of the formal unit root tests that are conducted through the use of the ADF and PP tests as a verifying unit root test. The null hypothesis of these tests is conducted on the basis that the data series has a unit root. The null hypothesis is rejected if the calculated test statistic value is greater than the critical value and thus there is no unit root, i.e. the data series is non-stationary. Notably, all variables are non-stationary in their level form. Hence, the evidence in terms of visual inspection has already been presented graphically in figure 5.1 and 5.2 that these variables become stationary in their first differences and table 5.3 will ensure that this is the case.

Table 5.3: Results of Formal Unit Root Testing for Variables

| Augmented Dickey Fuller and Philips-Peron Unit root tests | | | | |
|--|-------------------------|--------------|--------------|---|
| Variable | Model | ADF | PP | Conclusion |
| LEMP | Intercept | -0.519011 | -0.183395 | Non-stationary: Integrated of order 1 |
| | Trends and Intercept | -1.894716 | -1.296522 | |
| | None | 0.915124 | 1.475658 | |
| DLEMP | Intercept | -3.102170** | -3.1022170** | |
| | Trends and Intercept | -3.235099* | -3.324079* | |
| | None | -2.962818*** | -2.962818*** | |
| LFDI | Intercept | -0.532090 | -0.537989 | Non-stationary: Integrated of order 1 |
| | Trends and Intercept | -2.101308 | -2.242141 | |
| | None | 6.750836 | 5.753209 | |
| DLFDI | Intercept | -4.614421*** | -4.589183*** | |
| | Trends and Intercept | -4.502627*** | -4.469067*** | |
| | None | -1.665035* | -2.359241** | |
| LGDP | Intercept | 1.047103 | 0.955792 | Non-stationary: Integrated of order 1 |
| | Trends and Intercept | -2.385841 | -1.464050 | |
| | None | 2.932292 | 5.199608 | |
| DLGDP | Intercept | -4.362505*** | -4.421055*** | |
| | Trends and Intercept | -4.781459*** | -4.809028*** | |
| | None | -2.956667*** | -2.922523*** | |

| | | | | |
|--|--|--|--|---|
| TOP | Intercept Trends and Intercept None | -0.514346 -2.480669 1.102540 | -0.583538 -2.596717 1.037169 | Non-stationary: Integrated of order 1 |
| DTOP | Intercept Trends and Intercept None | -4.967649*** -4.906408*** -4.824146*** | -4.902411*** -4.834268*** -4.796300*** | |
| INF | Intercept Trends and Intercept None | -1.287257 -1.388831 -1.763323 | -1.351615 -2.741100 -1.496728 | Non-stationary: Integrated of order 1 |
| DINF | Intercept Trends and Intercept None | -2.819112* -5.062765*** -2.485838** | -9.356640*** -9.808289*** -5.634943*** | |
| LLC | Intercept Trends and Intercept None | -3.206745** -2.284241 1.990677 | -2.870368*** -2.385295 4.463741 | Non-stationary: Integrated of order 1 |
| DLLC | Intercept Trends and Intercept None | -3.888839*** -4.306477*** -1.055621 | -3.823358*** -4.186597** -1.820039* | |
| <p>Notes: Asterisks ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively. The optimal lag length selection for the unit root tests were selected using the AIC. The critical values for both the ADF and PP tests are obtained from MacKinnon (1996) tables.</p> | | | | |

Source: Researcher's estimation results.

Table 5.3 displays the results of the unit root that was conducted through the use of the ADF and PP tests for variables in both level form and first differences. These results were conducted based on the AIC. It is important to choose the appropriate lag length in order to generate statistics under these stationarity tests. Hence, this study chooses to use nine lags. However, other lag lengths were considered but yielded similar results. The results of the unit root provide the evidence that these two tests do not reject the null hypothesis that states there is a unit root when variables are in level form. In contrast to this, both tests (ADF and PP) found that there were no unit roots when the data series is converted into first differences, i.e. all variables are stationary after converting them into first differences. Therefore, the overall results of stationarity tests indicate that all the variables are integrated of order one, i.e., $I(1)$. Moreover, the stationarity results of $I(1)$ variables roughly indicate the possibility of a long-run co-integrating relationship that may exist between variables in the model specification before even conducting a formal Johansen co-integration test. Since all employed variables of the study are $I(1)$, the study extends the empirical analysis through the estimation of the VAR/VECM in the following section.

5.4 The VAR and VECM Estimation Processes

Section 5.5 deals with the selection of the order (p) VAR model and VECM results analysis. Numerous model selection criteria were estimated which include LR, FPE, AIC, SIC and HQC. Hence, detailed results of the model's estimation will be reported in order to show how the VAR (p) order was generated in this particular study. The researcher estimated only three major variables under the VAR/VECM method, i.e., employment (EMP), FDI and GDP, since this estimation produces theoretically plausible results and addresses the main objectives and hypotheses of the study.

5.4.1 Differencing the Variables for an Unrestricted VAR Model

It was previously mentioned in Chapter Four that the VAR models can only comprise stationary variables, i.e. $I(1)$ variables as of this study. Hence, for the purpose of unrestricted VAR models, all the variables were converted into first differences. This took place after variables had been transformed into natural logarithmic form with the exception of inflation and trade openness since they already exist in percentage form as computed from their respective sources. The unit root tests results that are reported

in table 5.3 reveal that all the variables are I(1). The reason for first differencing variables was to ensure that all variables are stationary.

5.4.2 The Lag Length Selection of VAR (p)

In modern economics, it has become a common practice to start by determining the selection of VAR before estimating the actual model. Ivanov and Kilian (2005) suggest that six model selection criteria are all applicable in the time series analysis, these include Akaike Information Criterion (AIC), the Hannan–Quinn Criterion (HQC), Schwarz Information Criterion (SIC), sequential Likelihood Ratio test (LR), a small-sample correction to this test (SLR) and Lagrange Multiplier (LM) test. The AIC and SBC are considered to be the most widely used criterion when choosing the appropriate (p) lag order in a VAR model. The study used the VAR lag length order (2) as selected by the AIC and FPE due to their advantage over data properties of the study. The estimated results of the lag length selection are presented in Table A2.

Seddighi *et al.* and Patterson (2000) suggested that the AIC and SBC tests should be the main criterion used when selecting the VAR model. However, SBC penalises heavily larger model orders and for moderate and large samples, and AIC is essentially equivalent. The FPE may outperform AIC in a very small sample sizes while HQC penalises high model orders more heavily than AIC but less than SBC. In light of the model selection criterion, the FPE and AIC was employed when selecting the VAR lag, order since the data set is relatively small for this particular study.

5.4.3 The Stability of the VAR model

The study employed the Autoregressive (AR) roots test to ascertain the stability of the VAR(2) model. The Autoregressive (AR) roots test results are shown in Table A3, and Figure A1 (see Appendix A). The findings from the Autoregressive (AR) roots test indicate that at least one root lies outside the unit circle, and therefore the VAR does not satisfy the stability condition. The highest modulus of 1.01 suggests that Johansen VECM methodology is the appropriate technique to use for estimating the long-run co-integrating relationship between variables in the system. Having presented and reported the AR roots test results, the results reveal that the VAR/VECM is a suitable model for this particular study. Therefore, the study estimates the VAR/VECM model to achieve the research objective and the study's hypotheses.

5.4.4 The Results of the Unrestricted VAR model Estimation

This subsection presents a discussion of the short-run relationship that exists among selected variables, through the use of the unrestricted VAR model, followed the Cholesky's ordering of variables: LEMP-LFDI-LGDP. The estimation of these three key variables is based on the robustness checks that were conducted and produced plausible results. On the other hand, INF, TOP and LLC were excluded from the VAR because they produced results with no economic sense and in contrast with the theory. As previously mentioned, all variables are expressed in natural logarithm form except for the inflation and trade openness, because they are already expressed in the percentage form. The various unit root tests were conducted and suggested that all variables are $1(1)$. Therefore, all data series were transformed into a stationary form through first differencing for the purpose of estimating the unrestricted VAR model which only explains the short-run dynamics that exists among variables.

The issue around co-integration and error correctional model will be dealt with in order to determine the long-run relationships that exist among selected variables. The proxy for each variable in the system was carefully chosen on annual frequency, i.e. 1980-2015. The lag orders for the model were chosen using Final Prediction Error (FPE) and AIC, due to their ability to outperform other model selection criteria in very small sample sizes (see Tables A2 for the reported results). The estimated results of the unrestricted VAR(2) model are displayed in Table A1. The estimated VAR(2) model is also used to test for causal link that may exist among variables through the use of Granger causality tests reported in subsection 5.4.6.

5.4.4.1 The VAR Diagnostic Tests Results

The study performed serial correlation, normality and heteroscedasticity tests in order to ascertain statistical adequacy and reliability of the estimated VAR(2) model. The results of these diagnostic inspection tests are demonstrated in Table A4. The results indicate that the estimated VAR(2) is free from autocorrelation, normality and heteroscedasticity. Therefore, from these findings it can be concluded that the estimated VAR(2) model has residuals that pass all the diagnostic inspection tests.

5.4.5 The Results of Co-integrating Vectors and VECM Estimation

This section deals with co-integration analysis, which seeks to assess the long-run relationship of all variables in the system. The previous section (5.4) presented the evidence that all variables are $I(1)$, which enables the researcher to apply the VECM method to ascertain the long-run relationships that exist among variables. Therefore, the study uses the Johansen co-integration test to assess the long-run co-integrating relationship between variables in the model specification of the study.

As previously explained, in co-integration analysis, there is no need for differencing the non-stationary variables to achieve stationarity because differencing the series may cause the important the long-run information to be lost along the process; hence data series can be estimated for co-integration in their level forms. Since all variables are $I(1)$ in the unit root tests results (see table 5.3), this is a rough indication of the possibility of co-integration between the variables under examination. However, certain steps must be followed before progressing with the Johansen co-integration test, as discussed in Chapter Four, section 4.3.3. The first step is to transform of the variables into logarithmic form, as previously discussed in earlier sections. This process will be followed by the selection of the VAR order (p), involving level variables. The third step is to select the deterministic components and the identification of the number of co-integrating vectors in the model. The final step is the identification of the model restriction, followed by the computation of the main co-integration test itself. As mentioned earlier, the researcher estimated the Johansen co-integration test based on assumption/case (ii), with variables in level form because this restriction produced plausible results with regard to the long-run relationships among variables (see Appendix B, Table B1).

5.4.5.1 The Results of the VAR Order (p) Selection for Co-integration Analysis

As previously stated, for VAR models to be stable, this particular study chooses to employ the FPE and AIC for selecting the suitable lag length of the VAR model, since the data set is relatively small (i.e., 36 observations). This procedure led to the selection of order (p) = 2 through the use of FPE and AIC for the whole estimation period under investigation (see the reported results in the Table A2).

5.4.5.2 The Results of the Johansen Co-integration Test Analysis

Table B2 (Appendix B) presents the results of trace and maximum eigenvalue statistics under the Johansen co-integration test. The trace and maximum eigenvalue test follows a numerical sequence when testing for a number of co-integrating vectors, i.e. $r = 0, 1, 2, \dots, n - 1$. For example if we reject the null hypothesis of at most zero co-integrating vectors in favour of one co-integrating relationship, then the following step will be to test the null hypothesis of at most one co-integrating vector against the alternative of two co-integrating vectors. Therefore, if p represents the number of variables (i.e., employment, FDI and GDP) and r is the number of co-integrating equations (rank), then trace statistics will test the null hypothesis stating that $r \leq p$ against the alternative hypothesis of $r + 1$ co-integrating vectors. On the other hand, the maximum eigenvalue will test the null of r co-integrating equation against the alternative hypothesis of $r + 1$ co-integrating equations. Hence, under both tests, if the calculated test statistics are greater than critical values, then the null hypothesis will be rejected. Conversely, the null hypothesis cannot be rejected if the calculated test statistics are less than the critical values.

The estimated results of co-integration test are presented in Table B2 (see Appendix B). Table B2 displays the calculated and critical values at 5% level of significance. The results indicate that the null hypothesis of zero co-integrating vectors ($r = 0$) is rejected by both the trace and the maximum eigenvalue tests, since their test statistics of 39.98 and 22.93 respectively, are a bit greater than their respective critical values of 35.19 and 22.30, respectively. However, the researcher could not reject the null hypothesis of, at most, one co-integrating vector ($r = 1$) in the system. The null hypothesis of one co-integrating vector ($r = 1$) cannot be rejected in both tests since the trace statistic of 17.05 is smaller than the critical value of 20.26 and the maximum eigenvalue of 10.55 is also smaller than the critical value of 15.90.

Likewise, the null hypothesis of two co-integrating vectors ($r = 2$) is not rejected because calculated statistics of both tests are smaller than their respective critical values, with the trace and the maximum eigenvalue statistic of 6.50 for both tests and their respective critical values of 9.16 for both tests. The co-integration test results under both Trace and Maximum eigenvalue indicates that the series has only one co-integrating relationship. Hence, the empirical analysis can conclude that there is a

long-run co-integrating relationship between variables in the system (i.e., LEMP, LFDI and LGDP). As mentioned earlier, the VAR and VECM is estimated using three key variables from the model specification of six (LEMP, LFDI, LGDP, INF, TOP and LLC) variables, due to robustness tests that were conducted. Furthermore, the error correction term (ECM) is used to show how the short-run dynamics return to the long-run equilibrium among variables through the use of α coefficients.

5.4.5.3 The Results of the Vector Error Correction Mechanism

The VECM results for three major variables (i.e., employment FDI and GDP) are clearly reported in Table B3, Appendix B. According to the estimated ADF and PP test, all variables are $I(1)$. Co-integration results confirmed that variables are co-integrated and there is only one co-integrating vector in the system. This will further lead to an estimation of VECM method incorporating the long-run co-integrating relations through ECM. As previously discussed in Chapter Four, section 4.3.3, $\alpha\beta$ denotes the ECM, where α shows the speed at which other variables, i.e. FDI and GDP, shift to eliminate the shocks in employment levels on an annual basis. Asterious and Hall (2016) assert that as β indicates the long-run adjustment coefficient, the α represents the speed at which the model re-establishes its long-run equilibrium position. The VECM results reported -0.024 speed of adjustment, which means that employment is moving by 0.024% in the current year in order to adjust the long-run disequilibrium as a result of employment deviating from this equilibrium by 1% in the previous year.

This error correction term indicates that there is no strong pressure on employment to restore long-run equilibrium whenever there is a disturbance in the system. The low speed of adjustment for employment may suggest that there are some other important factors that affect employment in South Africa, apart from FDI, such as the level of education, labour costs, inflation and trade union rigidity, among others. The error correction term for LFDI is statistically significant but possesses the incorrect sign, i.e., LFDI falls by 0.15% in this period as a result of LEMP overstepping its equilibrium in the previous period. Theoretically it ought to adjust to equilibrium by increasing, since it shares a negative long-run relationship with the dependent variable. However the adjustment coefficient is very low and not destabilising to the long-run equilibrium relationship. The short-run adjustment of LGDP to a previous period overshooting of LEMP, relative to its long-run co-integrating relationship, has the correct negative sign

and the magnitude of 0.017% is plausible. The short-form of the VECM short and long-run equation is presented in Table B3 in the following manner:

$$\Delta LEMP_t = -0.02(LEMP - 62.6 + 0.64LFDI_{t-1} - 5.2LGDP_{t-1}) + 0.38\Delta LEMP_{t-1} - 0.13\Delta LFDI_{t-1} + 0.18\Delta LGDP_{t-1} \quad (5.1)$$

As mentioned earlier, the long-run coefficients of the VECM must be interpreted as an opposite sign due the negative signs in the ECM equation. The long-run coefficient (β_{12}) suggests that a 1 percentage rise in FDI will cause employment to decrease by 0.64 percent per annum, statistically significant at 1%. On the other hand, the elasticity of employment to GDP, β_{13} (5.2) is of the correct positive sign and statistically significant at 5%. This is plausible because a rise in GDP ought to lead to a significant increase in employment. These results support the “Jobless Growth” theory formulated by Ricardo (1821), which states that there is a negative relationship between investment, output expansion and job creation because capital investment is a perfect substitute for labour in the economy. The empirical evidence of a negative impact of FDI on employment levels has been reported by a number of global researchers, such as Pinn *et al.* (2011); Wei (2013) and Onimisi (2014). These empirical findings are in line with the economic theory and empirical evidence presented in prior studies in Chapter Two and Three and therefore, these results are consistent with economic literature and are economically plausible.

Some of possible reasons for FDI to have a negative effect on employment levels are that FDI may displace domestic investment in such a way that the net effect on employment is less than the number of people employed directly by FOEs. Pinn *et al.* (2011) suggested that when FDI involves the acquisition of domestic firms instead of establishing new enterprises, the domestic employment level will stay the same, and if the foreign investor rationalises the firm, employment levels are even more likely to decrease in the domestic labour market. Fedderke and Romm (2004) asserted that the nature of FDI is more capital-intensive than labour-intensive, and capital investment favours the employment of a few skilled workers. Hence, employment opportunities that are created may be for relatively skilled labour, rather than the unskilled labour that is in excess supply in the South African labour market (Jenkins, 2006). According to Pinn *et al.* (2011), FDI can decrease employment levels by withdrawing investments and shutting down local firms through imposing intense

competition in the domestic market. Some of the worrying factors for South Africa include rigid labour market policies, militant labour unions and unskilled labour, which makes it difficult for foreign investors to invest in labour-intensive industries that will promote employment.

The co-integration results and VECM analysis suggest that a long-run co-integrating relationship exists between variables in the system. The evidence was presented that there is a single co-integrated vector in the model. The estimated VECM results confirmed that FDI and employment levels move in different directions, while GDP and employment generation move in the same direction in both short and long-run periods of the South African economy. The short-run coefficients for LEMP (0.38), LFDI (-0.13) and LGDP (0.18) have correct signs that complement the long-run coefficients and are also statistically significant at a conventional level, except for the LGDP coefficient that is insignificant in the short-run. These results are plausible and are a true reflection of the South African economy, because FDI takes about two to six years to exert an influence on economic growth.

5.4.5.4 The Results Discussions of the IRFs in the VECM

The impulse reaction function (IRF) results are shown in Figure B1 (Appendix B), presented over a ten year horizon. The results of the variance decompositions are demonstrated in Table B4 and B5, also for a ten-year horizon. These results are reported to give analysis of the selected variables in addressing the study's objectives and hypotheses. As previously mentioned, the main purpose for the estimation of the IRF and variance decomposition is to ascertain the degree of different shocks between employment, FDI and GDP in the system. The impulse response results reveal a considerable response of employment to the shocks of FDI and GDP. Employment shows a negative response of about -0.05% variation to the unexpected shocks of FDI while the response to the GDP is positive with about 0.04% variation. The impact of these shocks is mostly felt after a year and keeps on rising at an increasing rate over a 10-year horizon. FDI show a constant negative response to the shocks of employment with the shock felt after one year.

This finding confirms the rejection of the first hypothesis of the study which postulates a positive link between FDI and employment. FDI starts with a negative response to the shocks of GDP and the shock disappears after three years. The shock then starts

to respond positively at an increasing rate after three years throughout the forecast period. The impact of an unexpected shock to employment is immediately felt by GDP with a positive response. Hence, the second hypothesis of the study, which states that there is a positive relationship between GDP and employment, holds. On the other hand, GDP starts with a positive response to the shocks of FDI and then fades away after two years to respond negatively to the shocks of FDI throughout a 10-year horizon. These results show the relationship that is consistent with the coefficients produced by the VECM and single equation models, and also in line with economic theory. The IRF results are shown in graphical illustrations (Figure B1, Appendix B).

5.4.5.5 The Results of the Cholesky Variance Decomposition

The previous section focused on the estimation of the IRF of the key selected South African macroeconomic variables (i.e., FDI and GDP) to the shock of employment levels. The results demonstrate that the response of these macroeconomic variables to the shocks of employment levels has been consistent with the short and long-run coefficients of variables in the VECM analysis. Hence, this section will further undertake the estimation of the variance decomposition of variables in the system. As previously explained, the variance decomposition measures the contribution of each type of shock to the forecast error variance. Hence, estimating the variance components of these key selected macroeconomic variables allows one to observe the importance of each variable in the system in explaining variations in employment levels in the South African economy. The variance decomposition estimated in this section is for the period of ten years for all the variables.

Table B4 and B5 (Appendix B) shows the Cholesky variance decomposition for all the variables. Firstly, the estimated results reveal that under variance decomposition, employment starts by explaining itself by 100% and then began to shrink at a decreasing trend down to 63% throughout the ten year period, thus implying it takes a very long time for the effects of the shock to be dissipated. Furthermore, the FDI explain 26.6% of variations in employment levels. The role played by GDP accounted for 10.6% of the variation in employment levels overtime. The result of the role of FDI on average only explains 22% of the variation in employment levels. The GDP results explain 6% of variation in the forecast error variance of employment levels. Therefore, as expected, the overwhelming variation in the forecast error variance decomposition

is explained by the changes in employment levels. Moreover, the values of the variance decomposition of the study are in line with the theory of the forecast error variance decomposition.

5.4.5.6 The VECM Diagnostic Tests Results

The diagnostic tests of the model were conducted for the estimated VECM, which include autocorrelation, normality and heteroscedasticity tests in the VECM model (see Appendix B, Table B6). The serial correlation was conducted through autocorrelation LM tests with the null hypothesis stating that there is no autocorrelation between residuals. The results indicate that there is no autocorrelation in the estimated model, since the probability value is greater than 1%, 5% and 10% level of significance; therefore we accept the null hypothesis of no serial correlation in the VECM model. Heteroscedasticity testing was conducted using the white heteroscedasticity test (with no cross terms), the results revealed the residuals that are homoscedastic in the VECM model. The Cholesky of covariance (Lutkepohl) normality test was also carried out to test the normality of the residuals in the model. The null hypothesis of the normality test states that residuals are multivariate normal. The results show that the residuals in the estimated VECM model are normally distributed; therefore, the researcher cannot reject the null hypothesis. Importantly, the estimated VECM model was able to pass the diagnostic inspection tests against serial correlation, heteroscedasticity and normality. Hence the model conforms to the classical linear regression assumptions and the Gauss-Markov conditions holds.

5.4.6 The Results of Granger Causality

The study also estimated the VAR Granger causality Wald tests with variables in level form, since there is a possibility of multiple causal links between variables in the model. The Granger Causality test inspects the significance of the null hypothesis that there is no causal relationship between the variables at a particular level of significance. The alternative hypothesis states that there is causality direction between variables that are tested. The study uses a 10% level of significance to decide on whether to accept or reject the null hypothesis. The results of the VAR short-run Granger causality are shown in Table B7 (Appendix B). The null hypothesis, which states that LFDI does not Granger cause LEMP is rejected at 5% level of significance.

Importantly, the results indicate that there is a bi-directional causality between LEMP and LFDI at 5% level of significance. On the other hand, the null hypothesis that there is no causality between LGDP and LEMP cannot be rejected. The result of no causal link between employment and GDP must be viewed cautiously, since the VAR/VECM and single-equation approaches contradict these results. The study is inclined to trust the co-integration techniques due to the rigour involved in assessing the residuals of these models and the accompanying diagnostics tests. Lastly, there is unidirectional causality from FDI to GDP in the short-run. The VAR/VECM produced results that are theoretically plausible with regard to the relationship between employment, FDI and GDP. However, the researcher observed the importance of applying the alternative estimation techniques in order to confirm the results produced by the VECM method. Hence, for the purpose of this study, the OLS, FMOLS, DOLS and CCR estimation techniques will be estimated as supporting and verifying single equation models.

5.5 The Single Equation Estimation Models

This section deals with the estimation and interpretation of single equation models which include OLS, FMOLS, DOLS and CCR. In a modern economic time series analysis, it has become a common practice to use the verification models in order to verify the results obtained by the main model estimated. As previously mentioned, the primary purpose of estimating these single equation models is to confirm the results obtained by the VAR/VECM as the main model of this particular study. These four single equation models were estimated using six variables as indicated in the model specification of the study, i.e., employment, FDI, GDP, inflation, trade openness and unit labour costs. Unlike the VAR/VECM method, single-equation methods produced plausible results when employing all six variables in the model specification. In contrast, VAR/VECM produced plausible results when estimating the model using only the three main variables, which include employment, FDI and GDP.

5.5.1 The Ordinary Least Squares (OLS) Model Results

The estimated OLS equation is presented in Table C1, Appendix C. For the purpose of this particular study, the OLS method seeks to examine the relationship between the six variables in the model. The single equation long-run interaction of FDI, GDP,

inflation rate, trade openness and labour cost on employment is discussed further using OLS estimation technique under this section. Table C1 captures the following coefficients of each variable with t-statistics estimated the by OLS model:

$$LEMP = -6.70 - 0.13LFDI + 0.65LGDP + 0.5INF - 0.2TOP + 0.13LLC \quad (5.2)$$

$$[-4.44] \quad [-4.31] \quad [4.92] \quad [1.62] \quad [-1.01] \quad [2.78]$$

A negative elasticity coefficient of FDI suggests that if FDI increases by 1%, employment levels would decrease by 0.13%. The estimated OLS results suggest that employment responds positively to an increase in GDP and inflation rates as suggested by economic theory. Therefore, this finding makes economic sense and is consistent with economic theory as discussed in Chapter Two of the study. However, inflation and trade openness are both statistically insignificant in their effect on employment levels in the long-run. According to estimated results, when inflation rises by 1%, employment increases by 0.5%. The cost of labour also positively impacts employment levels with 0.13%, implying that if labour cost increases by 1%, employment would rise by 0.13%. However this relationship is not plausible, since it is in contrast with the theory. On the other hand, trade openness has an inverse relationship with employment levels in the South African economy, implying that a 1% increase in trade openness would result in employment contracting by 0.2%, but this effect is insignificant in the long-run.

The empirical findings of a negative impact of FDI on employment are consistent with those of Jenkins (2006), Binh (2013), Wei (2013), Onimisi (2014) and Strauss (2015). From the macroeconomic perspective, it is possible that FDI may have a negative effect on employment generation by crowding out local enterprises and bringing about insignificant impact on domestic employment levels in the economy. The empirical results suggest that the magnitude of FDI, GDP, inflation, trade openness and labour costs carry coefficients that are similar in all the single equation estimated models and with statistically significant coefficients, except for inflation and trade openness. However, in the case of the three variables in Johansen VECM, although the coefficients have the same signs, they have higher magnitudes compared to the single equation specifications. Hence, these findings reveal that the first hypothesis of the study is rejected, while the second and the third hypothesis hold according to both systematic and single equation models. Additionally, the OLS model was able to

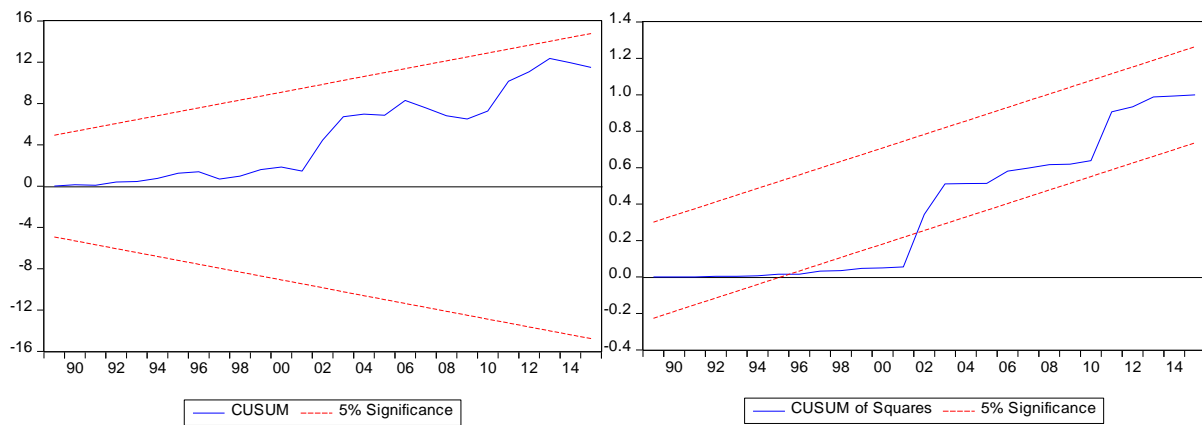
produce results that confirm and support the results obtained by the VAR/VECM model in achieving the objectives of the research and addressing the research hypotheses.

5.5.1.1 The OLS Diagnostic Tests

The estimated OLS model estimates reported in Table C1, Appendix C, indicates that the model fits very well with R^2 of 0.98%. Therefore, the results indicate a robust goodness-of-fit of the OLS model. The F -statistic also indicates that the overall model is statistically significant. The lagged dependent variable (LAGEMP) and squared key explanatory variable (FDISQR) were introduced in the model to deal with the issue of serial correlation and misspecification in the OLS regression model as discussed in Chapter Four of the study. Hence, the Durbin-Watson statistic of 1.26 indicates that the model with 36 observations is free from serial correlation. More importantly, all relevant model selection criteria indicate a correct functional form, with normally distributed and homoscedastic residuals. Hence, the OLS results meet the requirements of Gauss-Markov conditions since the model passes all the diagnostic tests against the regression pathologies, which include serial correlation, normality, and heteroscedasticity at 5% level of significance, shown in Table C2 and Figure C1.

The OLS model was subjected to structural breaks and stability examination using the recursive residuals (CUSUM and CUSUMSQ). These stability tests plot the cumulative sum together with the 5% critical lines. The two stability tests state that parameters are unstable if the cumulative sum goes out of the two critical lines. The graphical presentation of the CUSUM and CUSUMSQ tests is applied to the model as selected by the AIC. The statistic lies between the critical bounds area, indicating stability of the OLS model under both CUSUM and CUSUMSQ as shown in Figure 5.3 below. The stability results of the OLS model show that the CUSUM and CUSUMSQ plot deviates within the confidence interval band in a majority of the instances, thus verifying the structural stability of the OLS model. However, the CUSUMSQ does indicate some instability between 1996 and 2002, but this is reversed post 2002.

Figure 5.3: Graphical plots of CUSUM and CUSUMSQ residuals



Source: Generated by the researcher

Figure 5.3 indicates that the OLS model is structurally stable, because the plots of the CUSUM and CUSUM-SQ are within the critical bounds area of 5% significance level. The CUSUM-SQ test results reveal that long-run coefficients of the OLS model are structurally stable. Therefore, the OLS stability results indicate that the long-run parameters of employment and its regressors are structurally stable.

5.5.2 The Fully Modified Ordinary Least Squares (FMOLS) Model

The estimated FMOLS model results are presented in Table C4 (Appendix C). The results are estimated with the non-prewhitened Barlett kernel, Newey-West fixed bandwidth = 40.000 FMOLS model. The coefficients and t-statistics for each variable estimated by the FMOLS model is reported as follows:

$$LEMP = -18.66 - 0.16LFDI + 1.72LGDP + 1.0INF - 1.0TOP + 0.12LLC \quad (5.3)$$

$$[-9.10] \quad [-3.45] \quad [11.01] \quad [2.15] \quad [-2.91] \quad [1.55]$$

The results of a FMOLS model indicate that there is a significant negative long-run relationship between FDI and employment levels. The results suggest that a 1% rise in FDI causes employment to decrease by 0.16% in the long-run. This finding leads to the rejection of the first hypothesis of the study. However, the researcher cannot reject the third hypothesis, which states that there is a long-run co-integrating relationship among variables. A positive coefficient of GDP implies that a unitary increase in GDP leads to a 1.72% rise in employment levels, *ceteris paribus*. These elasticity coefficients are both statistically significant at 1% level of significance. This finding supports the second hypothesis of the study. As expected, inflation positively impacts

on employment with the elasticity coefficient of 1.0%. This finding is in line with the economic theory, which supports the view of the Phillips (1958) curve. A negative coefficient of -1.0% for trade openness suggests that a 1% rise in trade openness would result in a 1.0% decrease in employment. A positive coefficient of labour cost suggests that a 1% rise in labour cost would result in a 0.12% increase in employment.

However, the coefficient elasticity of trade openness is not theoretically plausible in the conventional sense because the more the country becomes open to trade, the more employment and growth transpires in the country. The major reason for this deviation from conventional theoretical perspectives concerning the negative impact of trade openness on employment could be cheap imports that are imported from countries with low economies of scale and cheap labour costs, which could result in a negative effect on domestic output levels, and thus employment levels. The coefficient result of labour cost is also not theoretically plausible, since it is expected that a rise in the cost of labour will correlate with a decrease in employment levels, and vice versa. The main reason for this effect could be that it is the cost of labour for skilled workers that is increasing, rather than that for unskilled labour, which is in excess supply in the South African labour market. Finally, the results of the FMOLS model confirm the existence of a long-run co-integrating relationship between employment and its regressors, as suggested by the Johansen co-integration method. The co-integration between variables in the FMOLS is conducted using the Engle-Granger and Phillips-Ouliaris tests. Therefore, the FMOLS support the VECM results.

5.5.2.1 FMOLS Diagnostic Test Results

The high value of R^2 of 0.91% indicates that the estimated regression line fits very well and variations in employment are fully explained by variations in FDI, GDP, inflation, trade openness and labour cost in the long-run. The normality test results are presented in Figure C4, Appendix C and reveal that the residuals in the FMOLS model are normally distributed. This statistical diagnostic inspection result confirms that the estimated FMOLS is statistically valid and reliable.

5.5.3 The Dynamic Ordinary Least Squares (DOLS) Model

The estimated DOLS model results are presented in Table C5, Appendix C. The long-run equilibrium equation of the DOLS model is reported as follows:

$$LEMP = -16.98 - 0.24LFDI + 1.61LGDP + 2.0INF - 1.0TOP + 0.28LLC \quad (5.4)$$

$$[-5.29] \quad [-5.21] \quad [6.68] \quad [3.03] \quad [-2.05] \quad [3.06]$$

The results produced by the DOLS complement those estimated by the FMOLS model, and hence those of the VECM. The above equation (5.7) suggests that a 1% rise in FDI causes employment levels to decrease by 0.24%, *ceteris paribus*. The long-run positive coefficients for GDP, inflation and labour costs indicate that a 1% change in these variables would lead to a 1.61%, 2.0% and 0.28% increase in employment levels respectively, all statistically insignificant at 1% level of significance. On the other hand, a negative coefficient of trade openness reveals that if trade openness increases by 1%, employment would contract by 1.0 at 5% level of significance. These variables have a long-run relationship with employment as suggested by Engle-Granger and Phillips-Ouliaris tests for co-integrating regression equations. The DOLS model also supports the VECM long-run estimates.

5.5.3.1 The DOLS Diagnostic Inspection

The high value of R^2 0.99 indicates that the DOLS model is a robust model with an excellent goodness-of-fit, as explained by all explanatory variables in the DOLS model. The normality test results shown in Figure C5, Appendix C suggest that the residuals of the DOLS model are normally distributed. These results indicate that the DOLS model is statistically valid and reliable.

5.5.4 The Canonical Co-integration Regression (CCR) Model

The estimated CCR long-run equilibrium results are shown in Table C6, Appendix C. The estimated CCR regression equation is reported as follows:

$$LEMP = -18.25 - 0.16LFDI + 1.68LGDP + 1.0INF - 1.0TOP + 0.13LLC \quad (5.5)$$

$$[-8.98] \quad [-2.93] \quad [11.46] \quad [1.75] \quad [-2.80] \quad [1.30]$$

The CCR results suggest that increasing FDI inflows by 1% would result in a 0.16% decrease in employment in the long-run at 1% level of significance, *ceteris paribus*. In contrast, a 1% increase in GDP, inflation and labour cost causes employment levels to rise by 1.68%, 1.0% and 0.13% at 1%, 10% respectively and labour cost is insignificant to affect employment. Moreover, a negative coefficient of trade openness indicates that a 1% rise in trade openness would lead to a contraction of 1% in

employment. These results validate the results obtained from the OLS, FMOLS and DOLS with regard to the relationship between FDI and employment in the long-run.

5.5.4.1 The CCR Diagnostic Inspection Tests

The R^2 of 0.91 suggests that the overall CCR model is a good model with an excellent goodness-of-fit, thus suggesting that 91% of the variations in employment are explained by variations in FDI, GDP, inflation, trade openness and labour cost. The F-statistic of the CCR model indicates that the overall model is statistically significant. The CCR normality test results shown in Figure C6, Appendix C reveal that residuals of the CCR model are normally distributed.

5.6 The Summary of the Empirical Results

The primary objective of the study is to provide an in-depth examination of the contribution of FDI to employment levels in the South African economy. In line with this objective, the study ought to ascertain the magnitudes at which FDI affects employment levels in both the short and long-run in the South African economy. Secondly, it is of paramount importance to ascertain the contribution of each supporting variable in the regression model towards achieving sustainable employment levels. Finally, the study has been able to ascertain the direction of causation among FDI, GDP and employment through the estimation of the unrestricted VAR model. In an attempt to achieve the primary objective of the study and also to confirm whether the hypotheses hold or not, the overall empirical analysis estimated by both multiple and single equation models estimation are thoroughly discussed in this section. Table 5.4 below presents the summarised results of both short and long-run coefficients for each variable affecting employment (LEMP) for the purpose of simplicity when discussing and comparing the findings of both multiple and single equation methods.

Table 5.4: Summary of Short and Long-Run Relationships

| Sample Size 1985 to 2015 (Annual Data, i.e., 36 Observations) | | | | | | |
|---|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| Variables | VECM | | OLS | FMOLS | DOLS | CCR |
| | SR | LR | | | | |
| LEMP | 0.38** [2.55] | - | - | - | - | - |
| LFDI | -0.13*** [-3.26] | -0.64*** [2.18] | -0.13*** [-4.31] | -0.16*** [-3.50] | -0.24*** [-5.21] | -0.16*** [-2.93] |
| LGDP | 0.18 [0.56] | 5.21** [-2.88] | 0.65*** [4.92] | 1.72*** [11.01] | 1.61*** [6.68] | 1.68*** [11.46] |
| INF | - | - | 0.5 [1.62] | 1.0** [2.15] | 2.0** [3.03] | 1.0* [1.75] |
| TOP | - | - | -0.2 [-1.01] | -1.0*** [-2.91] | -1.0* [-2.05] | -1.0*** [-2.80] |
| LLC | - | - | 0.13*** [2.78] | 0.12 [1.55] | 0.28*** [3.06] | 0.13 [1.30] |

Notes:

- SR and LR denote short and long-run, respectively.
- t-statistics are represented by [].
- ***, **and * indicate statistical significance level at 1%, 5% and 10% respectively.
- The ECM (α) coefficients for the VECM model is not included in this table but is discussed under subsection 5.5.5.3.

The above estimated results of the VECM, OLS, FMOLS, DOLS and CCR methods provide evidence of a long-run co-integrating relationship between employed variables in both single and systemic equations models. Thus this finding is consistent with the economic theory presented in Chapter Two of the study. These empirical findings clearly demonstrate that the effect of FDI on domestic employment levels in the South African economy is negative and highly significant at a 1% level of significance in both short and long-run relationships in all models under consideration. The summary of the results shown in table 5.6 clearly shows that the results of single-equation models

confirm those of the VECM in relation to the impact of FDI on employment, thus the researcher was able to accomplish the primary aim and objectives of the study.

From table 5.4, systemic equation models generates a negative short and long-run coefficient capturing the impact of FDI on employment levels. The short-run coefficients of FDI estimated by the VECM shows that if FDI rises by 1%, employment will contract by 0.13%. The empirical findings of this study are plausible and make economic sense, because all models that were estimated produced coefficients that point in the same direction in both the short and long-run. Fedderke and Romm (2006) suggested that the effects of FDI is negative on employment because FDI are usually more capital-intensive than labour-intensive.

In the long-run, multiple and single equation methods complement one another, suggesting that the FDI negatively and significantly affect employment and its long-run coefficients range across the following spectrum under VECM, FMOLS, DOLS and CCR respectively: -0.64%, -0.16%, -0.24% and -16%. These are all significant at 1% level of significance. The OLS model shows that if FDI increases by 1%, employment will fall by 0.13%, significant at 1% level of significance in the long-run. Hence, all models that test for a long-run co-integrating relationship suggest that FDI has a negative and statistically significant impact on employment levels in the long-run in the economy of South Africa. The VECM results reveal that if FDI increases by 1%, then employment levels would contract by 0.64% in the long-run. The FMOLS, DOLS and CCR results suggest that a 1% rise in FDI would lead to a 0.16%, 0.24% and 0.16% fall in employment level in the long-run, respectively. These findings are consistent with the empirical literature conducted in the same subject area as shown in the work of Jenkins, (2006), Binh, (2013), Wei (2013) and Onimisi, (2014), among others.

The long-run coefficient elasticity of LGDP indicates that GDP plays a very important role in increasing employment levels in South Africa's economy. The estimated results of the VECM, FMOLS, DOLS and CCR suggest that if GDP were to rise by 1%, employment levels would increase by 5.21%, 1.72%, 1.61% and 1.68%, at 5% and 1% level of significance, respectively. This finding is in line with economic theory and empirical evidence given by prior studies on the same subject, as presented in Chapter Two and Three of the study, respectively. Two of the six variables inflation and unit labour costs also have a positive impact on employment levels in the long-run, as only suggested by single co-integrating regression equations, i.e. FMOLS, DOLS and CCR

model, since the VECM only estimates the interaction between employment, FDI and GDP. The elasticity magnitude of inflation ranges from 1.0%, 2.0% and 1.0% significant at 5% for FMOLS and DOLS, and significant at 10% for CCR, respectively. The coefficients for labour costs are 0.12%, 0.28% and 0.13% under FMOLS, DOLS and CCR respectively, and only the DOLS coefficient is significant at 1%.

The OLS coefficients for inflation and labour cost are 0.5% and 0.13% significant at 1% significance level, but inflation is insignificant to affect employment. The positive coefficients of inflation and labour costs indicate that these two variables positively impact employment levels in the long-run. This finding is consistent with the theory of the Phillips (1958) curve with regard to the relationship between inflation rate and employment levels. As previously explained, the finding of labour cost contradicts several of the conclusions in the empirical literature but it can be argued and derived into economic logic that the increasing costs of labour in this regard are for highly skilled labour rather than unskilled labour, which is in excess supply in the South African labour market.

On the other hand, co-integrating regression equations found that trade openness was negative and statistically insignificant to affect employment levels in the long-run. The coefficients' magnitudes of trade openness are -1.0% for all three single co-integrating regression equations (FMOLS, DOLS and CCR) at 1%, 10% and 1% level of significance, respectively. This implies that a 1% increase in trade openness would lead to a 1.0% decline in employment levels. The OLS coefficient for trade openness was also found to be negative but statistically insignificant in its influence on employment. OLS results suggest that a 1% rise in trade openness would lead to a 0.2% decrease in employment levels. This finding also conflicts with the findings of prior studies. However, the economic reasoning behind this relationship could be that our major trading partners are providing cheap imports, which could lead to a negative impact on domestic output levels and employment levels in the long-run.

The VECM short and long-run estimates are consistent with the *a priori* expectations of the study, except for labour cost and trade openness, and the single co-integrating regression equations confirm these results. The VECM results suggest that the coefficient value of an ECM is negative and less than one, as suggested by economic theory. The graphical presentation of the IRF of the VECM confirms that employment responds negatively to a surprise shock in FDI, with a significant magnitude. The IRF

indicates an instantaneous positive impact of GDP on employment levels in the short-run. These empirical findings validate and confirm the estimated regression results obtained by the VECM, OLS, FMOLS, DOLS and CCR model.

The single-equation model (OLS, FMOLS, DOLS and CCR) provides results that are consistent with those of the VECM method in all cases, with respect to both short and long-run coefficients of employment, FDI and GDP. The magnitudes of the coefficients of variables tend to vary closely between the VECM multi-equation approach and the single equation models. Hence, most of these variations are consistent with the theoretical and empirical literature reported in Chapter Two and Three of the study. The implication of negative short and long-run coefficient estimates is that FDI cannot be used to promote employment levels in the economy, but they could be good for growth and other development capacity of the country.

From an economic view point, this implies that inward FDI leads to jobless growth in the South African economy. As previously mentioned, from the macroeconomic perspective, it is possible that FDI may have a negative effect on employment by crowding out domestic enterprises and have an insignificant effect on domestic employment levels in the economy, despite this process stimulating growth and development of the South African economy. More importantly, GDP and inflation have a significant positive impact on employment levels, implying that a rise in any of these two macroeconomic variables will eventually lead to a rise in employment levels in both the short and long-term. These implications are consistent with both theoretical and empirical literatures reported in Chapter Two and Three, and are confirmed by the estimated results of both systems and single equation methods.

Furthermore, the VAR Granger Causality test was also generated in order to address the fourth hypothesis of the study, by revealing the causality direction between employment, FDI and GDP. The results indicate that a bi-directional causality exists between employment and FDI at a 5% level of significance. The findings also reveal a unidirectional causal link from GDP to FDI at 5% level of significance. The results find no directional causal link between employment and GDP, implying that GDP and employment are strongly exogenous to explain the movements in employment levels and vice versa. Therefore, this finding suggests that the researcher cannot reject the fourth hypothesis, which states that there is causality between variables in the model.

Importantly, considering the overall estimation of the results from this particular research, the following conclusions are drawn with regard to the study's hypotheses:

- hypothesis 1 of the study is rejected, due to a negative and highly statistically significant relationship that exists between FDI and employment levels;
- the researcher fails to reject hypothesis 2 because the results reveal a positive and highly significant correlation between GDP and employment;
- Hypothesis 3 of the study cannot be rejected as well because of a long-run co-integrating relationship suggested by the Johansen co-integration test, which was executed through the use of the VECM approach.
- Finally, the researcher cannot reject hypothesis 4 because there is a causality relationship that exists among variables in the system, except for employment and GDP, which indicate no causal link from one to the other.

5.7 Conclusion

The central focus of the study was to assess the contribution of FDI to employment levels in the South African economy. The empirical analysis of the study was conducted using six macroeconomic variables, which include employment, FDI, GDP, inflation, trade openness and unit labour costs. This chapter has been able to provide the empirical findings using different sophisticated econometric estimation techniques, through the eviews 9 statistical software package. The empirical analysis of the study started by transforming non-stationary variables into stationary series through first differencing the series for the purpose of modelling the unrestricted VAR model. All variables employed in the study were found to be non-stationary in level form but after converting them into first differences they became stationary, i.e., $I(1)$. Stationarity tests were conducted based on the combination of both visual inspection (graphical demonstrations) and formal unit root tests (i.e. ADF and PP tests).

The study also estimated the IRF, forecast error variance decomposition and Granger causality test for selected macroeconomic variables under the VAR/VECM model. The co-integration analysis was also carried out using the Johansen co-integration techniques in order to ascertain the long-run co-integrating relationship that exists among variables under a VECM. The researcher found a long-run co-integrating relationship between employment, FDI and GDP. The long-run findings of multiple

equation methods reveal that FDI has a significant negative effect on employment levels in the South African economy. However, the long-run impact of GDP on employment levels is positive and highly statistically significant in South Africa. Both single and systemic equations produced theoretically consistent and plausible results and thus achieved the central aim and objectives of the study. Moreover, the short and long-run coefficients of most variables are in line with the *a priori* expectations of the study as estimated by VAR/VECM, OLS, FMOLS, DOLS and CCR.

Chapter Six: Conclusion and Recommendations

6.1 Introduction

Chapter Six is the final chapter, which summarises the overall findings of the study before providing policy recommendations based on empirical evidence, as well as the strengths and weaknesses of the study, and also provide recommendations for future research endeavours. This chapter is divided into six sections. Section 6.1 introduces the chapter. A summary of the study and discussion of empirical findings are discussed in section 6.2, before the policy recommendations and implications are discussed in section 6.3. Section 6.4 presents the strengths and weaknesses of the study or limitations of the study. Section 6.5 outlines the implications and recommendations for prospective studies. Lastly, section 6.6 concludes this chapter.

6.2 Summary of the Study

The main purpose of the research was to assess the contribution of FDI to domestic employment levels in South Africa's economy. The central focus of the study was to examine how the key selected macroeconomic variables reacted to the relationship between FDI and employment levels in South Africa. The study cautiously selected the main macroeconomic components that have been considered in theoretical literature, as well as in other international empirical studies conducted by different international researchers in the same field of study. These macroeconomic variables include employment, FDI, GDP, inflation rate, trade openness and unit labour costs. This particular study is unique from prior studies in using more recent data sets and sophisticated econometric models and by focusing on the necessity of FDI in promoting domestic employment levels in the South African economy. Despite several empirical works being carried out across the globe, it still remains a point of debate as to whether inward FDI has a positive effect on employment creation, in order to assist developing countries to combat the problem of high unemployment rate and the shortage of foreign investments in their economies. Importantly, this particular research has been able to contribute to the body of knowledge by giving more empirical evidence to ascertain the significance of FDI in employment generation,

through examining the contribution of FDI on domestic employment levels in the South African economy using annual time series data in the period of 1980 to 2015.

The preliminary examinations were properly carried out using formal unit root tests (ADF and PP) and visual inspection for all variables, in order to achieve the research objectives and to ascertain the research hypotheses. As previously stated, all variables were found to be non-stationary in level form but they were stationary after converting them into first differences, i.e. $I(1)$. The study estimated the unrestricted VAR model technique, through the use of IRF, variance decomposition and Granger causality test to ascertain the short-run relationships between selected variables in the model. The research further estimated a long-run co-integration relationship between all the $I(1)$ variables. The advantage of modelling $I(1)$ variables in the form of a co-integrating relationship, as dictated by theory or a conceptual framework, is that there is no need to difference these variables to render them stationary, for vital information is lost in the process. However, the residuals of such a co-integrating relationship is $I(0)$. The results estimated under co-integration analysis revealed that a long-run co-integrating relationship exists among variables.

The results estimated through the Johansen co-integration test reveal that both trace and maximum eigenvalue statistics tests suggest that there is a long-run relationship between variables in the system. Therefore, the researcher went further to estimate the VECM using the Johansen methodology to ascertain the long-run relationships among the variables. This was made possible because all the variables exhibited $I(1)$ properties. The estimated long-run results indicate a plausible and a significant long-run relationship between FDI and employment levels. The researcher considers a VAR/VECM methodological approach as superior, more reliable and advanced approach, compared to the single-equation methods, because the model is based on a comprehensive Johansen VECM methodology, which incorporates $I(1)$ variables in systems of equations, and captures all the possible interactions between the variables through lagged changes in first differenced $I(1)$ variables and the error correction terms that are based on co-integrating vectors describing the structural relations in the economy. However, the VAR/VECM approach is very sensitive to small magnitudes of the data set, typically time series analyses. Hence, this model requires huge data sets, which have been considered as a major weakness of this study so far.

Theoretically, FDI is linked to the strengthening of economic growth, employment opportunities and other developmental capacities of the country. Conversely, the empirical findings of this particular study suggest that FDI has a negative and statistically significant effect on employment levels in South Africa. As articulated earlier, this could be as a result of the nature of FDI that is being attracted to our shores, which is more capital-intensive rather than labour-intensive and favours the employment of a few skilled individuals, thus leading to a negative impact on employment generation. A possible reason for this type of FDI being attracted to the shores of a small- middle income emerging market economy like South Africa is that it has strong labour unions that have kept the wage rate high, which crowds out FDIs earmarked for low-wage, highly labour-intensive investment projects. Furthermore, economic growth was found to be highly significant in stimulating employment levels, hence this positive correlation implies that GDP plays an important role in improving employment levels and is one of its main determinants.

This relationship is highly significant and makes economic sense as it is consistent with economic theory and the empirical literature, as discussed in Chapter Two and Three of the study. The single equation models generated results that reveal that inflation is statistically significant and positively correlated, with employment levels as suggested by economic theory. Labour cost also positively affects employment in both the short and long-run. On the other hand, trade openness was found to be statistically significant and negatively associated with employment levels in the economy of South Africa. The empirical results estimated through the use of the VAR/VECM, and verified by the OLS, FMOLS, DOLS and CCR model, are consistent, from short-run magnitudes to those of the long-run, between all selected macroeconomic variables in the models. These empirical findings were generated by multiple equation methods and confirmed by the estimation of single equation models. The empirical results from this particular study are theoretically plausible; hence they justify and satisfy the objectives of the study as centred around the study's hypotheses.

6.3 Policy recommendations

The empirical findings of this particular study have important policy implications as far as the relationship between FDI, employment and economic growth is concerned in

the South African economy. As previously mentioned, the main results pertaining the effect of FDI on employment levels in the South African economy are estimated by multiple equation methods and verified by single equation models. A number of developing countries in the world have been attracting and creating an enabling environment for FDI to take place, and as a result, inward FDI has become the cornerstone of the government's policy in addressing objectives such as creating employment opportunities, eradicating poverty and uplifting the standard of living in many developing nations. Hence, the study recommends that it is imperative for South Africa to continue to promote policies that aim to attract FDI for the purpose of improving other macroeconomic developmental objectives that will create job opportunities to help reduce a high unemployment rate, but also to develop a social compact with trade unions to accept lower wages for the unskilled labour market segment, so that appropriate FDIs targeting labour-intensive industries becomes viable. This could be done through special economic zones that make it particularly attractive for low-wage, highly labour-intensive investment projects to flourish.

The results from both multiple and single equation methods estimated in the study complement each other in concluding that drawing inward FDI into the economy has a significant negative effect on employment levels in both the short and long-run. However, an increase in the economic growth has a significant and positive effect on South Africa's employment levels. Hence, it is imperative for policymakers to put more emphasis on providing policies and regulations that attract FDI, not for the purpose of promoting employment levels, but for other growth and developmental opportunities such as capitalising on exports promotion, development of human capital and technological spill-over in the long-run of the South African economy.

The observed negative impact of FDI on employment growth could be minimised if policies that aim to attract FDI are integrated into effective economic reform policies. South Africa has a number of strategies in place to attract FDI inflows (see discussion in sub-section 2.3.7). However a refinement in some of these policies ought to be considered if a country wants to be successful in improving the employment effects of FDI and economic growth. The South African government should keep up with strong bi-lateral agreements with its trading partners to assure a significant, positive spill-over effects of FDI inflows on employment and economic growth. It is also important to diversify FDI inflows across different economic sectors, in order to improve its impact

on job creation and economic growth, for an example, manufacturing sector is known for involving a lot of labour-intensive work, and therefore directing more FDI in this sector can play a huge role in reducing unemployment, promoting local production, and thus job opportunities. Policymakers ought to be fully aware that capital-intensive FDI tends to augment economic growth through exports promotion and technological progress, as advocated by Romer (1990) in his Endogenous Growth Theory, rather than inclusive economic growth and development through employment creation.

Strauss (2013) suggested that industries with capital-intensive FDI do not provide high opportunities for employment creation through investments in human capital. Hence, resources should also be allocated to improving human capital in order to equip people with relevant education and skills that will make them employable, and thus increase the employment effects of FDI and economic growth. Furthermore, FOEs are duty-bound to abide by domestic laws and regulations of the host nation and provide good employment conditions, respect human dignity, and provide training and development to domestic employees. As mentioned earlier, it is also important for South Africa to reconsider some of its labour market regulations and provide proper education and training to local employees in order to provide foreign companies with competitive and efficient workforces (Kingdon and Knight, 2007). Conforming to these principles will ensure that the South African economy attracts more FDI inflows, which will ensure greater economic development through employment opportunities and inclusive growth, and thus improving the standard of living in South Africa.

Several empirical studies conform to the notion that the key motive for FOEs to do business in many developing countries is mainly to exploit natural resources and cheap labour cost in developing countries. The researcher strongly suggests that FDI should be treated with caution to ensure that it benefits the domestic economy. This means that terms, regulations and conditions governing the inflow of FDI should be those promulgated by the government of the host country to avoid exploitation by foreign investors from developed countries, but without discouraging them from investing into the economy of the country. These regulations should ensure that FDI inflows do not only help to grow the economy but also strive to create employment opportunities, reduce inequality and improve the standard of living in the country.

6.4 Strengths and Weaknesses of the Study

As previously indicated in the empirical findings, the estimated long-run coefficients results of both VAR/VECM and single equation models confirm the policy prescription to the economy, which states that FDI inflows have a significant negative effect on domestic job creation but there is a positive and significant effect of economic growth on employment generation in South Africa's national economy. Hence, the government and policymakers should put more emphasis on policies that aim to attract FDI inflows, in order to promote growth but not to improve the employment effect of FDI in the economy. The study used three different methods in the context of VAR/VECM model framework, namely, IRF, forecast error variance decomposition and co-integration analysis. Moreover, all three methods pointed in the same direction, i.e. they show that FDI has a significant negative short-run relationship with employment levels and the predictable long-run relationships exist among the selected South African macroeconomic variables under consideration in the study.

However, the VAR/VECM model framework is very sensitive to a small sample size and this model is perfect for large sample sizes. This turns out to be the greatest weakness of this study. The weakness of utilising a small sample size in this study could be the major reason for some contradictions that were observed in the analysis of the VECM, with respect to certain variables, such as inflation, trade openness and labour cost, as this model performs best with large time series data sets. However, the single equation models, particularly OLS, FMOLS, DOLS and CCR methods, which are suitable for small data sets were also estimated as a supporting and confirmatory model. Moreover, the single-equation methods (OLS, FMOLS, DOLS and CCR) were able to produce economically plausible results. Hence the process of estimating both single equations and systems of equations contributed to the strengths of this particular study. Furthermore, the observed limitations of the study turn out to be the sample size, which only covers annual data from the period of 36 years, i.e. 1980-2015, thus giving 36 observations, which is relatively small in terms of frequency selection (annual data), but able to assess the long-term effect of FDI on employment levels in the South African economy. Prospective studies ought to overcome such problems in order to get more valid and robust statistical results for empirical analysis.

6.5 Recommendations for Future Research

In order to perfectly assess the long-term impact of FDI on domestic employment levels in the South African economy, prospective studies ought to focus mainly on larger sample sizes, in order to estimate the VAR/VECM model, because this is suitable for large datasets and also due to the fact that stationarity and co-integration analysis are more robust in the context of large sample sizes. Future studies ought to extend the analysis by including other variables, such as government expenditure and fiscal policy, in explaining how fiscal policy and possibly monetary policy could be used to promote employment levels in the South African economy.

Prospective studies ought to focus on the dynamic interactions between FDI and employment levels and provide clarification on how GDP, inflation, trade openness and unit labour cost affect these interactions, possibly through rectifying and overcoming the weaknesses of the current study, as previously explained in Section 6.3. Furthermore, future studies ought to use alternative and possibly more advanced estimation techniques such as Dynamic Stochastic General Equilibrium (DSGE), Panel VAR/VECM and other sophisticated econometric estimation models.

6.6 Conclusion

This chapter summarised the entire thesis, the empirical findings, outlined policy recommendations and implications, highlighted the strengths and weaknesses of the study and also proposed the areas of prospective studies. In summation, research on the contribution of FDI to domestic employment levels has been previously conducted in the global literature, yet there is still a gap. A number of studies presented prior to the era of some of the advanced econometric techniques, such as error correction models (ECM) under the same investigation, are statistically unreliable and their findings ought to be treated with caution.

In light of the study's findings, empirical analysis has been extensively carried out, using advanced econometric techniques and employing both multiple and single equation models, i.e. VAR/VECM and OLS, FMOLS, DOLS and CCR models. Hence, the results confirmed that FDI has a negative and statistically significant relationship with employment levels in both the short and long-run. Moreover, an increase in economic growth has a significant positive impact on accelerating employment levels

in the long-run, as suggested by the economic theory. Hence, it is of paramount importance for South Africa to put more emphasis, not only on economic policies, that will promote economic growth, but also, on policies, formulated in consultation with trade unions, to attract FDIs earmarked for low-wage, highly labour-intensive industries. Such approaches, working together, will address high unemployment rates leading to a positive spill-over effect on economic growth in the South African economy, as suggested by the empirical findings of this particular study.

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Results of Appendices: Appendix A

Appendix A contains Table A1 with the results of an unrestricted VAR model estimation. Table A2 records the selection unrestricted VAR order through the use of AIC and FPE statistics, which are used to demonstrate how the VAR orders (p) of the various models were chosen for the unrestricted VAR model (Table A1). The results of VAR stability through the autoregressive roots are reported in Figure A1. The diagnostic test results of the VAR model are shown in Table A3.

Table A1: The Unrestricted VAR Model Estimation Results

| Vector Autoregression Estimates | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|
| Date: 02/09/17 Time: 22:13 | | | |
| Sample (adjusted): 1982 2015 | | | |
| Included observations: 34 after adjustments | | | |
| Standard errors in () & t-statistics in [] | | | |
| | LEMP | LFDI | LGDP |
| LEMP(-1) | 1.234516 (0.17156) [7.19578] | -0.251566 (0.72352) [-0.34770] | 0.063633 (0.10046) [0.63343] |
| LEMP(-2) | -0.422594 (0.15924) [-2.65385] | 0.540282 (0.67155) [0.80453] | -0.073589 (0.09324) [-0.78923] |
| LFDI(-1) | -0.129679 (0.04837) [-2.68090] | 0.928392 (0.20400) [4.55101] | -0.029389 (0.02832) [-1.03759] |
| LFDI(-2) | 0.096768 (0.04466) [2.16658] | -0.037851 (0.18836) [-0.20095] | 0.038333 (0.02615) [1.46572] |
| LGDP(-1) | 0.264694 (0.32643) [0.81089] | 0.234868 (1.37663) [0.17061] | 1.178159 (0.19114) [6.16388] |
| LGDP(-2) | 0.091815 (0.34730) [0.26436] | 0.278264 (1.46468) [0.18998] | -0.208789 (0.20336) [-1.02667] |
| C | -3.943163 (1.69787) [-2.32242] | -7.229086 (7.16042) [-1.00959] | 0.405455 (0.99419) [0.40782] |
| R-squared | 0.979427 | 0.992063 | 0.994709 |
| Adj. R-squared | 0.974855 | 0.990299 | 0.993534 |
| Sum sq. resids | 0.032322 | 0.574869 | 0.011082 |
| S.E. equation | 0.034599 | 0.145916 | 0.020260 |
| F-statistic | 214.2281 | 562.4507 | 846.0621 |
| Log likelihood | 70.04824 | 21.11564 | 88.24504 |
| Akaike AIC | -3.708720 | -0.830332 | -4.779120 |
| Schwarz SC | -3.394469 | -0.516081 | -4.464869 |
| Mean dependent | 4.336858 | 11.74338 | 14.50783 |
| S.D. dependent | 0.218192 | 1.481473 | 0.251945 |
| Determinant resid covariance (dof adj.) | | 8.89E-09 | |
| Determinant resid covariance | | 4.45E-09 | |
| Log likelihood | | 182.1832 | |
| Akaike information criterion | | -9.481366 | |
| Schwarz criterion | | -8.538614 | |

Table A2: The Selection of the order of the unrestricted VAR model

VAR Lag Order Selection Criteria
 Endogenous variables: LEMP LFDI LGDP
 Exogenous variables: C
 Date: 02/10/17 Time: 21:55
 Sample: 1980 2015
 Included observations: 34

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|----------|-----------|-----------|------------|------------|------------|
| 0 | 16.23288 | NA | 9.22e-05 | -0.778405 | -0.643726 | -0.732475 |
| 1 | 172.4918 | 275.7509* | 1.60e-08 | -9.440691 | -8.901976* | -9.256974* |
| 2 | 182.1832 | 15.39235 | 1.56e-08* | -9.481366* | -8.538614 | -9.159861 |

* 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

Figure A1: VAR Autoregressive roots results

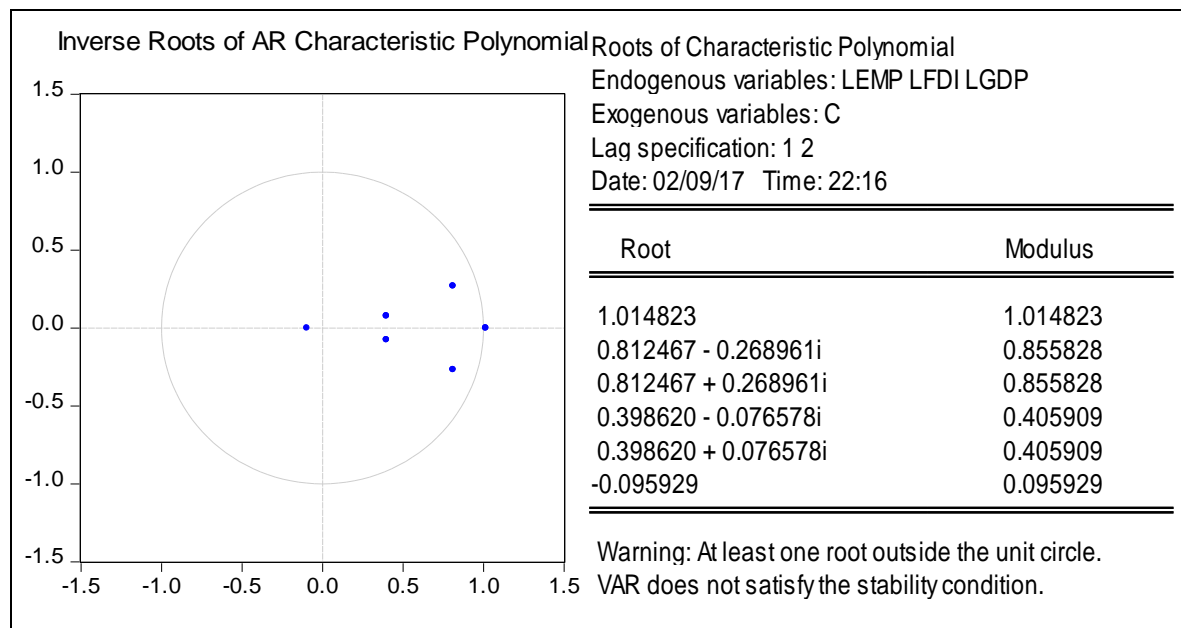


Table A3: The VAR diagnostic inspection tests

VAR Residual Serial Correlation LMT...
 Null Hypothesis: no serial correlation a...
 Date: 02/09/17 Time: 22:17
 Sample: 1980 2015
 Included observations: 34

| Lags | LM-Stat | Prob |
|------|----------|--------|
| 1 | 6.679168 | 0.6705 |
| 2 | 6.205922 | 0.7191 |
| 3 | 3.924576 | 0.9163 |

Probs from chi-square with 9 df.

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
 Date: 02/09/17 Time: 22:18
 Sample: 1980 2015
 Included observations: 34

Joint test:

| Chi-sq | df | Prob. |
|----------|----|--------|
| 80.15966 | 72 | 0.2386 |

VAR Residual Normality Tests
 Orthogonalization: Cholesky (Lutkepohl)
 Null Hypothesis: residuals are multivariate normal
 Date: 02/08/17 Time: 20:57
 Sample: 1980 2015
 Included observations: 34

| Component | Jarque-Bera | df | Prob. |
|-----------|-------------|----|--------|
| 1 | 7.650761 | 2 | 0.0218 |
| 2 | 0.886229 | 2 | 0.6420 |
| 3 | 0.789428 | 2 | 0.6739 |
| Joint | 9.326418 | 6 | 0.1560 |

Results of Appendices: Appendix B

Appendix B - The Johansen Co-integration Procedure

This appendix section gives a clear demonstration and presentation of the results of the Johansen co-integration methodology. Table B1 gives the summary of models for co-integration. The numbers (r) of co-integrating vectors were selected through the use of trace and max-eigenvalue tests reported in Table B2. The VECM estimation results are demonstrated in Table B3. Figure B1 demonstrates the impulse responses to innovation of all the variables in the system. The results of the variance decompositions are shown in Table B4 and B5. Table B6 presents the VECM diagnostic tests results. The results of VAR granger causality are shown in Table B7.

Table B1: Summary of co-integration models

| | | | | | |
|---|--------------------------|-----------------------|-----------------------|--------------------|--------------------|
| Date: 02/08/17 Time: 21:00 | | | | | |
| Sample: 1980 2015 | | | | | |
| Included observations: 34 | | | | | |
| Series: LEMP LFDI LGDP | | | | | |
| Lags interval: 1 to 1 | | | | | |
| Selected (0.05 level*) Number of Cointegrating Relations by Model | | | | | |
| Data Trend: | None | None | Linear | Linear | Quadratic |
| Test Type | No Intercept No Trend | Intercept No Trend | Intercept No Trend | Intercept Trend | Intercept Trend |
| Trace | 1 | 1 | 0 | 0 | 0 |
| Max-Eig | 1 | 1 | 0 | 0 | 0 |
| *Critical values based on MacKinnon-Haug-Michelis (1999) | | | | | |

Table B2: Selection λ max and λ trace Statistics

Date: 02/08/17 Time: 21:01
 Sample (adjusted): 1982 2015
 Included observations: 34 after adjustments
 Trend assumption: No deterministic trend (restricted constant)
 Series: LEMP LFDI LGDP
 Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|------------------------------|------------|--------------------|------------------------|---------|
| None * | 0.490514 | 39.97842 | 35.19275 | 0.0141 |
| At most 1 | 0.266829 | 17.05046 | 20.26184 | 0.1306 |
| At most 2 | 0.173956 | 6.497663 | 9.164546 | 0.1556 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|------------------------------|------------|------------------------|------------------------|---------|
| None * | 0.490514 | 22.92797 | 22.29962 | 0.0408 |
| At most 1 | 0.266829 | 10.55279 | 15.89210 | 0.2866 |
| At most 2 | 0.173956 | 6.497663 | 9.164546 | 0.1556 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Table B3: The VECM Results for co-integrating vectors

| Vector Error Correction Estimates | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|
| Date: 02/08/17 Time: 21:03 | | | |
| Sample (adjusted): 1982 2015 | | | |
| Included observations: 34 after adjustments | | | |
| Standard errors in () & t-statistics in [] | | | |
| Cointegrating Eq: | CointEq1 | | |
| LEMP(-1) | 1.000000 | | |
| LFDI(-1) | 0.638470 (0.29246) [2.18314] | | |
| LGDP(-1) | -5.217160 (1.81103) [-2.88077] | | |
| C | 62.63943 (22.9595) [2.72826] | | |
| Error Correction: | D(LEMP) | D(LFDI) | D(LGDP) |
| CointEq1 | -0.024308 (0.00921) [-2.63933] | -0.149597 (0.03812) [-3.92415] | -0.016949 (0.00554) [-3.06127] |
| D(LEMP(-1)) | 0.381655 (0.14981) [2.54766] | -0.187462 (0.62008) [-0.30232] | -0.001161 (0.09006) [-0.01289] |
| D(LFDI(-1)) | -0.134343 (0.04117) [-3.26326] | 0.154786 (0.17040) [0.90835] | -0.041877 (0.02475) [-1.69206] |
| D(LGDP(-1)) | 0.181374 (0.32212) [0.56306] | -1.276555 (1.33332) [-0.95742] | 0.281131 (0.19365) [1.45177] |
| R-squared | 0.490297 | 0.162308 | 0.124363 |
| Adj. R-squared | 0.439327 | 0.078539 | 0.036799 |
| Sum sq. resids | 0.037295 | 0.638984 | 0.013479 |
| S.E. equation | 0.035259 | 0.145943 | 0.021196 |
| F-statistic | 9.619287 | 1.937567 | 1.420254 |
| Log likelihood | 67.61525 | 19.31811 | 84.91735 |
| Akaike AIC | -3.742074 | -0.901065 | -4.759844 |
| Schwarz SC | -3.562502 | -0.721494 | -4.580272 |
| Mean dependent | 0.015992 | 0.177272 | 0.021313 |
| S.D. dependent | 0.047088 | 0.152036 | 0.021597 |
| Determinant resid covariance (dof adj.) | 1.07E-08 | | |
| Determinant resid covariance | 7.35E-09 | | |
| Log likelihood | 173.6580 | | |
| Akaike information criterion | -9.274000 | | |
| Schwarz criterion | -8.555713 | | |

Figure B1: VECM impulse response functions

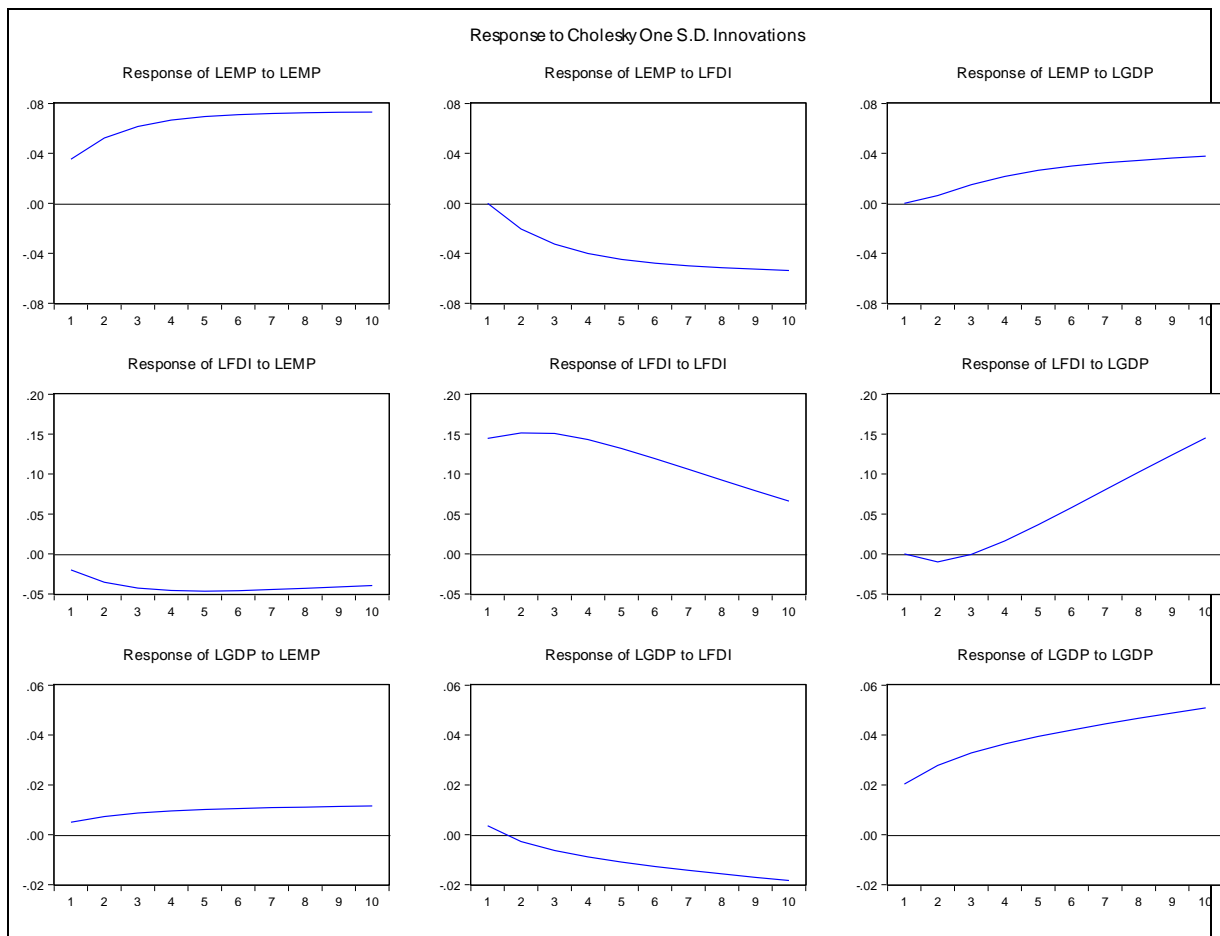


Table B4: Variance decomposition of employment (LEMP)

| Variance Decomposition of LEMP: | | | | |
|---------------------------------|----------|----------|----------|----------|
| Period | S.E. | LEMP | LFDI | LGDP |
| 1 | 0.035259 | 100.0000 | 0.000000 | 0.000000 |
| 2 | 0.066710 | 89.61172 | 9.509626 | 0.878655 |
| 3 | 0.097659 | 81.63297 | 15.63543 | 2.731601 |
| 4 | 0.126744 | 76.11698 | 19.35253 | 4.530492 |
| 5 | 0.153621 | 72.23935 | 21.71877 | 6.041883 |
| 6 | 0.178409 | 69.39954 | 23.32088 | 7.279577 |
| 7 | 0.201379 | 67.22559 | 24.46929 | 8.305115 |
| 8 | 0.222821 | 65.49072 | 25.33422 | 9.175054 |
| 9 | 0.242991 | 64.05473 | 26.01342 | 9.931849 |
| 10 | 0.262104 | 62.82894 | 26.56560 | 10.60547 |

Cholesky Ordering: LEMP LFDI LGDP

Table B5: Variance decomposition of foreign direct investment (LFDI)

| Variance Decomposition of LFDI: | | | | |
|---------------------------------|----------|----------|----------|----------|
| Period | S.E. | LEMP | LFDI | LGDP |
| 1 | 0.145943 | 1.869126 | 98.13087 | 0.000000 |
| 2 | 0.213488 | 3.638674 | 96.13904 | 0.222284 |
| 3 | 0.264861 | 4.973318 | 94.88166 | 0.145027 |
| 4 | 0.304941 | 6.008109 | 93.59893 | 0.392959 |
| 5 | 0.337515 | 6.800739 | 91.70444 | 1.494826 |
| 6 | 0.365604 | 7.371420 | 88.81062 | 3.817955 |
| 7 | 0.391627 | 7.723557 | 84.72857 | 7.547877 |
| 8 | 0.417482 | 7.860029 | 79.47233 | 12.66764 |
| 9 | 0.444605 | 7.793654 | 73.24267 | 18.96367 |
| 10 | 0.474025 | 7.551075 | 66.37506 | 26.07386 |

Cholesky Ordering: LEMP LFDI LGDP

Table B6: The VECM diagnostic tests

VEC Residual Serial Correlation LMT...
 Null Hypothesis: no serial correlation a...
 Date: 02/08/17 Time: 21:14
 Sample: 1980 2015
 Included observations: 34

| Lags | LM-Stat | Prob |
|------|----------|--------|
| 1 | 7.976060 | 0.5366 |
| 2 | 8.276733 | 0.5065 |
| 3 | 4.026769 | 0.9096 |

Probs from chi-square with 9 df.

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
 Date: 02/08/17 Time: 21:15
 Sample: 1980 2015
 Included observations: 34

Joint test:

| Chi-sq | df | Prob. |
|----------|----|--------|
| 67.08189 | 48 | 0.0357 |

VECM Residual Normality Tests
 Orthogonalization: Cholesky (Lutkepohl)
 Null Hypothesis: residuals are multivariate normal
 Date: 02/08/17 Time: 21:15
 Sample: 1980 2015
 Included observations: 34

| Component | Jarque-Bera | df | Prob. |
|-----------|-------------|----|--------|
| 1 | 41.99212 | 2 | 0.0000 |
| 2 | 0.610483 | 2 | 0.7369 |
| 3 | 2.188254 | 2 | 0.3348 |
| Joint | 44.79086 | 6 | 0.0000 |

Table B7: The VAR model Granger causality results

VAR Granger Causality/Block Exogeneity Wald Tests
 Date: 02/09/17 Time: 19:13
 Sample: 1980 2015
 Included observations: 34

Dependent variable: LEMP

| Excluded | Chi-sq | df | Prob. |
|----------|----------|----|--------|
| LFDI | 7.522991 | 2 | 0.0232 |
| LGDP | 1.015952 | 2 | 0.6017 |
| All | 9.164585 | 4 | 0.0571 |

Dependent variable: LFDI

| Excluded | Chi-sq | df | Prob. |
|----------|----------|----|--------|
| LEMP | 6.042423 | 2 | 0.0487 |
| LGDP | 4.481017 | 2 | 0.1064 |
| All | 7.038098 | 4 | 0.1339 |

Dependent variable: LGDP

| Excluded | Chi-sq | df | Prob. |
|----------|----------|----|--------|
| LEMP | 0.855250 | 2 | 0.6521 |
| LFDI | 6.344840 | 2 | 0.0419 |
| All | 7.292029 | 4 | 0.1212 |

Results of Appendices: Appendix C

Appendix C, Table C1 presents the simple OLS model estimates. The results of OLS model diagnostic tests are reported in Table C2 and Figure C1. The results of OLS stability analysis are presented in Figure C2. The Fully Modified Least Squares (FMOLS) results are shown in Table C3 and the normality test results in Figure C3. Table C4 demonstrates the results of the Dynamic Least Squares (DOLS) and its normality test results in Figure C4. The Canonical Co-integrating Regression (CCR) results are reported in Table C5 and Figure C5.

Table C1: The OLS Model Estimates

| Dependent Variable: LEMP Method: Least Squares Date: 02/08/17 Time: 21:50 Sample (adjusted): 1981 2015 Included observations: 35 after adjustments | | | | |
|--|-------------|-----------------------|-------------|-----------|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LFDI | -0.132257 | 0.030652 | -4.314793 | 0.0002 |
| LGDP | 0.647664 | 0.131605 | 4.921283 | 0.0000 |
| INF | 0.004536 | 0.002807 | 1.615997 | 0.1177 |
| TOPP | -0.002019 | 0.001996 | -1.011439 | 0.3208 |
| LLC | 0.126346 | 0.045427 | 2.781269 | 0.0098 |
| FDISQR | 1.93E-14 | 8.73E-15 | 2.207284 | 0.0360 |
| LAGLEMP | 0.651519 | 0.080632 | 8.080102 | 0.0000 |
| C | -6.704011 | 1.509258 | -4.441925 | 0.0001 |
| R-squared | 0.980468 | Mean dependent var | | 4.332304 |
| Adjusted R-squared | 0.975405 | S.D. dependent var | | 0.216642 |
| S.E. of regression | 0.033976 | Akaike info criterion | | -3.728715 |
| Sum squared resid | 0.031167 | Schwarz criterion | | -3.373206 |
| Log likelihood | 73.25251 | Hannan-Quinn criter. | | -3.605993 |
| F-statistic | 193.6259 | Durbin-Watson stat | | 1.258523 |
| Prob(F-statistic) | 0.000000 | | | |

Table C2: The OLS diagnostic inspection tests

Table C2.1: Serial Correlation Results - Correlogram 'Q' Statistics

Date: 02/08/17 Time: 21:51
 Sample: 1980 2015
 Included observations: 35

| Autocorrelation | Partial Correlation | AC | PAC | Q-Stat | Prob |
|-----------------|---------------------|-----------|--------|--------|-------|
| | | 1 0.356 | 0.356 | 4.8292 | 0.028 |
| | | 2 -0.073 | -0.229 | 5.0403 | 0.080 |
| | | 3 -0.148 | -0.042 | 5.9292 | 0.115 |
| | | 4 -0.111 | -0.059 | 6.4457 | 0.168 |
| | | 5 -0.410 | -0.457 | 13.708 | 0.018 |
| | | 6 -0.335 | -0.064 | 18.713 | 0.005 |
| | | 7 -0.074 | -0.072 | 18.969 | 0.008 |
| | | 8 0.082 | -0.086 | 19.288 | 0.013 |
| | | 9 0.106 | 0.037 | 19.851 | 0.019 |
| | | 10 0.125 | -0.123 | 20.654 | 0.024 |
| | | 11 0.108 | -0.080 | 21.285 | 0.031 |
| | | 12 -0.093 | -0.253 | 21.775 | 0.040 |
| | | 13 -0.183 | -0.187 | 23.754 | 0.033 |
| | | 14 -0.071 | -0.022 | 24.069 | 0.045 |
| | | 15 -0.065 | -0.264 | 24.339 | 0.060 |
| | | 16 -0.072 | -0.139 | 24.690 | 0.075 |

Table C2.2: Serial correlation results - correlogram squared residuals

Date: 02/08/17 Time: 21:52
 Sample: 1980 2015
 Included observations: 35

| Autocorrelation | Partial Correlation | AC | PAC | Q-Stat | Prob |
|-----------------|---------------------|-----------|--------|--------|-------|
| | | 1 0.201 | 0.201 | 1.5450 | 0.214 |
| | | 2 -0.191 | -0.242 | 2.9815 | 0.225 |
| | | 3 0.117 | 0.237 | 3.5394 | 0.316 |
| | | 4 0.251 | 0.128 | 6.1689 | 0.187 |
| | | 5 0.098 | 0.085 | 6.5831 | 0.254 |
| | | 6 -0.106 | -0.102 | 7.0889 | 0.313 |
| | | 7 -0.060 | -0.039 | 7.2576 | 0.403 |
| | | 8 -0.030 | -0.132 | 7.2994 | 0.505 |
| | | 9 -0.044 | -0.035 | 7.3975 | 0.596 |
| | | 10 -0.210 | -0.223 | 9.6925 | 0.468 |
| | | 11 -0.201 | -0.081 | 11.872 | 0.373 |
| | | 12 -0.097 | -0.112 | 12.405 | 0.414 |
| | | 13 -0.189 | -0.165 | 14.499 | 0.340 |
| | | 14 -0.242 | -0.151 | 18.101 | 0.202 |
| | | 15 -0.035 | 0.072 | 18.181 | 0.253 |
| | | 16 0.020 | -0.019 | 18.207 | 0.312 |

Table C2.3: Breusch-Godfrey serial correlation results

| Breusch-Godfrey Serial Correlation LM Test: | | | |
|---|----------|---------------------|--------|
| F-statistic | 2.781745 | Prob. F(2,25) | 0.0811 |
| Obs*R-squared | 6.371071 | Prob. Chi-Square(2) | 0.0414 |

Table C2.4: Heteroskedasticity test results

| Heteroskedasticity Test: Breusch-Pagan-Godfrey | | | |
|--|----------|---------------------|--------|
| F-statistic | 1.971826 | Prob. F(7,27) | 0.0967 |
| Obs*R-squared | 11.83982 | Prob. Chi-Square(7) | 0.1060 |
| Scaled explained SS | 5.469015 | Prob. Chi-Square(7) | 0.6029 |

Figure C1: The OLS Normality tests

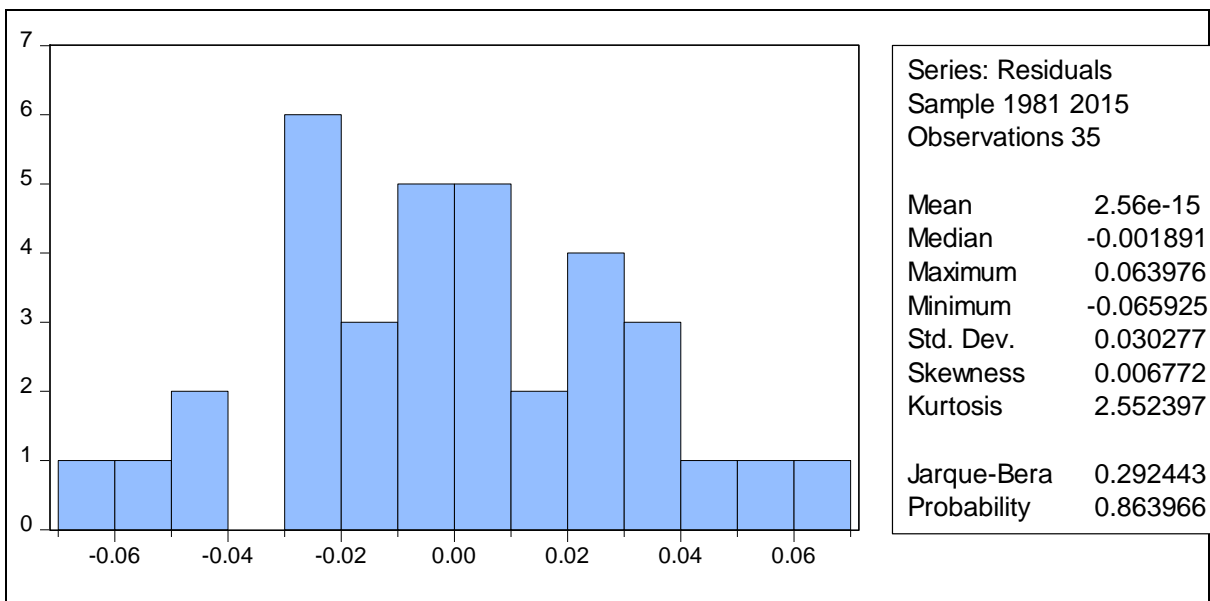
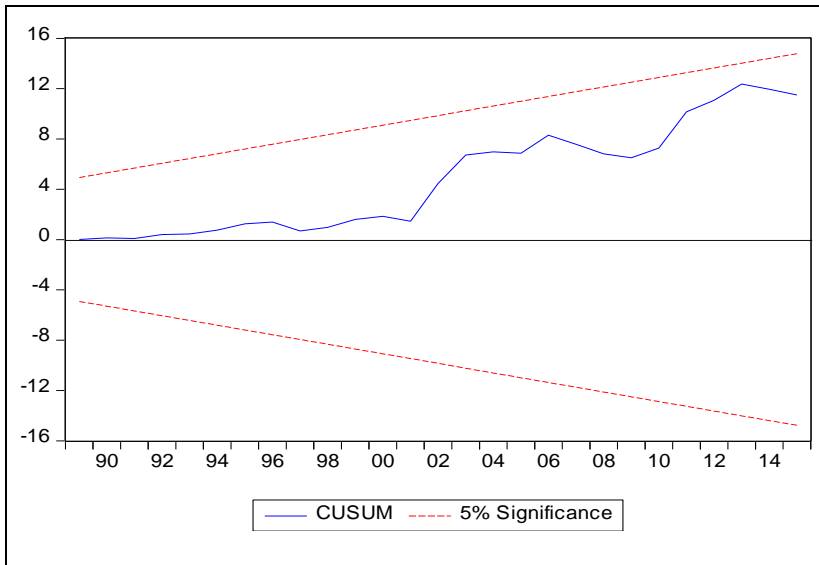


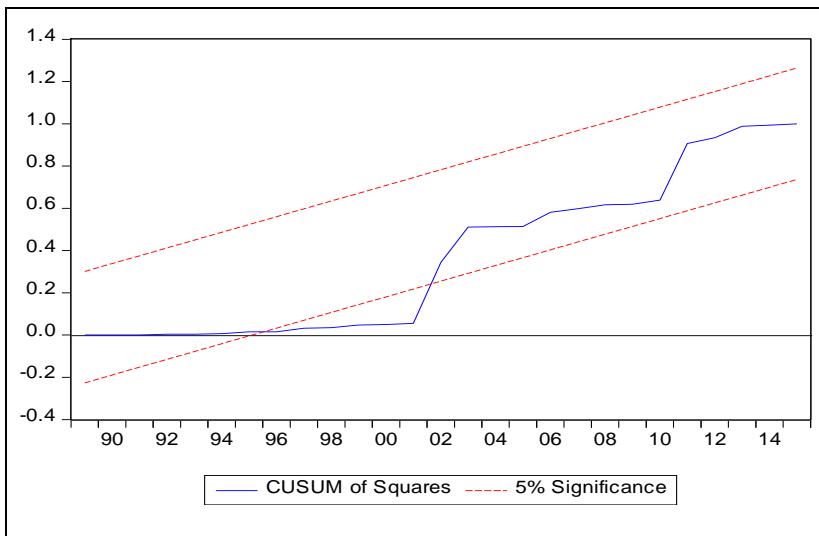
Figure C2: The OLS stability analysis

Figure C2 (a): Plot of cumulative sum of recursive residuals



Source: Estimation results.

Figure C2 (b): Plot of cumulative sum of squares of recursive residuals



Source: Estimation results.

Table C3: Fully Modified Least Squares (FMOLS) results

| Dependent Variable: LEMP | | | | |
|---|-------------|--------------------|-------------|--------|
| Method: Fully Modified Least Squares (FMOLS) | | | | |
| Date: 02/17/17 Time: 11:33 | | | | |
| Sample (adjusted): 1981 2015 | | | | |
| Included observations: 35 after adjustments | | | | |
| Cointegrating equation deterministics: C | | | | |
| Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000) | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LFDI | -0.161303 | 0.046099 | -3.499029 | 0.0015 |
| LGDP | 1.717188 | 0.155955 | 11.01080 | 0.0000 |
| INF | 0.011500 | 0.005340 | 2.153613 | 0.0397 |
| TOP | -0.010463 | 0.003591 | -2.913615 | 0.0068 |
| LLC | 0.117273 | 0.075425 | 1.554840 | 0.1308 |
| C | -18.66328 | 2.051821 | -9.095960 | 0.0000 |
| R-squared | 0.913903 | Mean dependent var | 4.332304 | |
| Adjusted R-squared | 0.899058 | S.D. dependent var | 0.216642 | |
| S.E. of regression | 0.068830 | Sum squared resid | 0.137389 | |
| Long-run variance | 0.004651 | | | |

Figure C3: FMOLS Normality test results

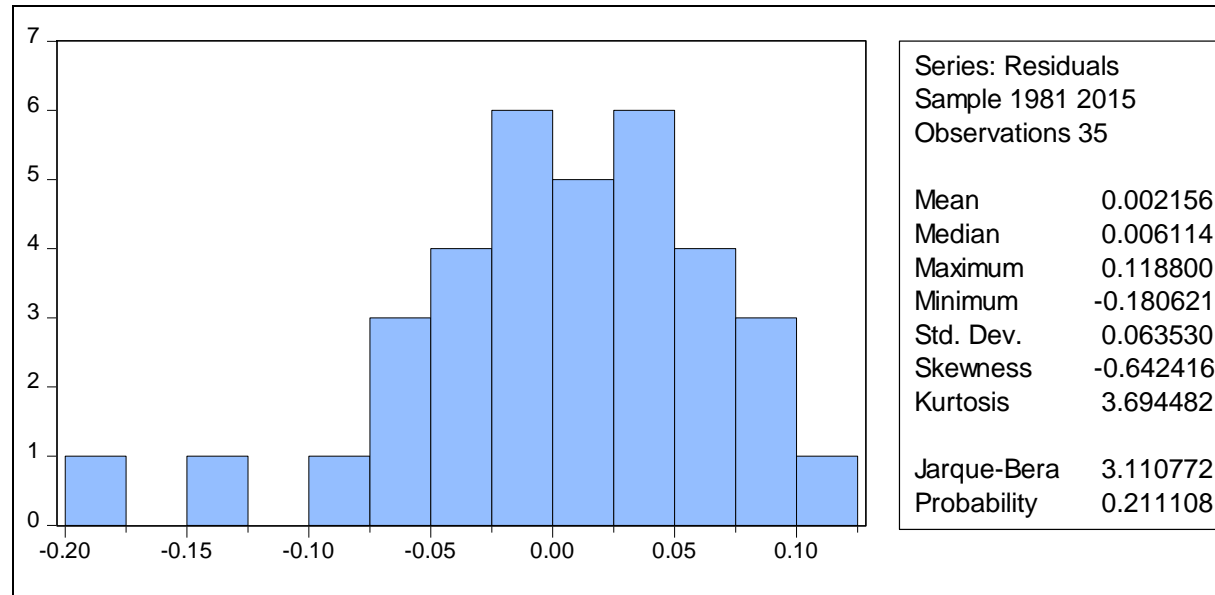


Table C4: Dynamic Least Squares (DOLS) results

Dependent Variable: LEMP
 Method: Dynamic Least Squares (DOLS)
 Date: 02/17/17 Time: 11:35
 Sample (adjusted): 1982 2014
 Included observations: 33 after adjustments
 Cointegrating equation deterministic: C
 Fixed leads and lags specification (lead=1, lag=1)
 Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|--------|
| LFDI | -0.236860 | 0.045505 | -5.205132 | 0.0002 |
| LGDP | 1.614729 | 0.241717 | 6.680242 | 0.0000 |
| INF | 0.022755 | 0.007500 | 3.034233 | 0.0104 |
| TOP | -0.011897 | 0.005798 | -2.051946 | 0.0627 |
| LLC | 0.282934 | 0.092463 | 3.059964 | 0.0099 |
| C | -16.97709 | 3.208773 | -5.290836 | 0.0002 |

| | | | |
|--------------------|----------|--------------------|----------|
| R-squared | 0.989253 | Mean dependent var | 4.325212 |
| Adjusted R-squared | 0.971341 | S.D. dependent var | 0.210571 |
| S.E. of regression | 0.035648 | Sum squared resid | 0.015249 |
| Long-run variance | 0.001112 | | |

Figure C4: DOLS Normality test results

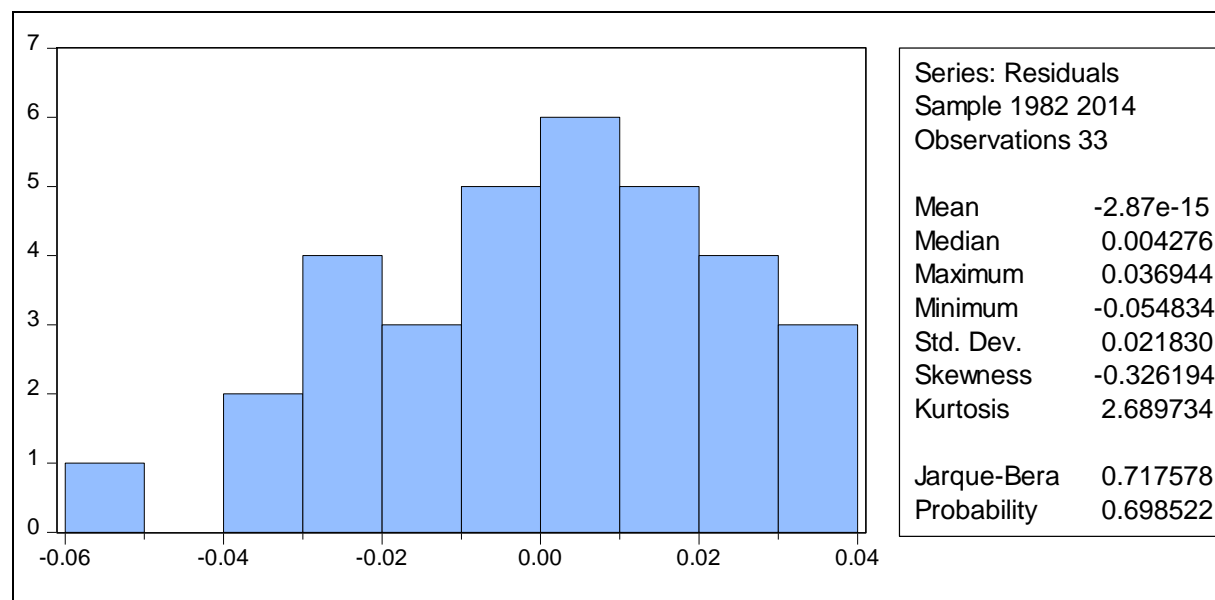


Table C5: Canonical Co-integrating Regression (CCR) results

| Dependent Variable: LEMP | | | | |
|---|-------------|--------------------|-------------|--------|
| Method: Canonical Cointegrating Regression (CCR) | | | | |
| Date: 02/17/17 Time: 11:37 | | | | |
| Sample (adjusted): 1981 2015 | | | | |
| Included observations: 35 after adjustments | | | | |
| Cointegrating equation deterministics: C | | | | |
| Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000) | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LFDI | -0.160278 | 0.054762 | -2.926795 | 0.0066 |
| LGDP | 1.684321 | 0.146955 | 11.46148 | 0.0000 |
| INF | 0.012510 | 0.007164 | 1.746136 | 0.0914 |
| TOP | -0.010203 | 0.003644 | -2.799971 | 0.0090 |
| LLC | 0.125139 | 0.096212 | 1.300665 | 0.2036 |
| C | -18.24823 | 2.031067 | -8.984555 | 0.0000 |
| R-squared | 0.914738 | Mean dependent var | 4.332304 | |
| Adjusted R-squared | 0.900038 | S.D. dependent var | 0.216642 | |
| S.E. of regression | 0.068495 | Sum squared resid | 0.136056 | |
| Long-run variance | 0.004651 | | | |

Figure C5: CCR Normality test results

